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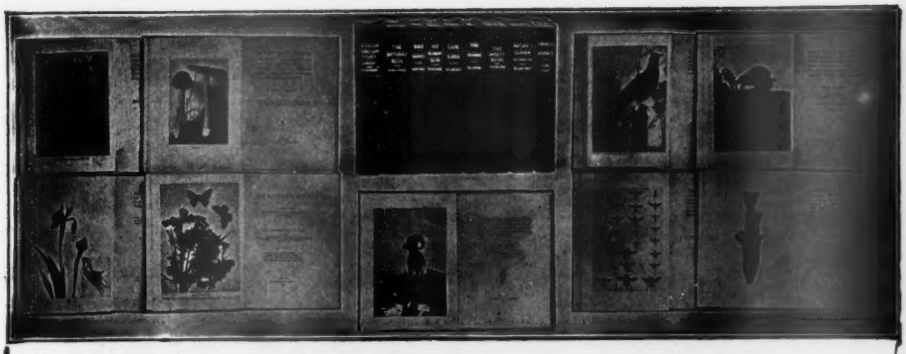

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The objects of the Association, as set forth in its Constitution, are as follows:

1. The adoption by the Federal Government of a permanent policy for the reclamation and settlement of the public domain, under which all the remaining public lands shall be held and administered as a trust for the benefit of the whole people of the United States, and no grants of the title to any of the public lands shall ever hereafter be made to any but actual settlers and homebuilders on the land.

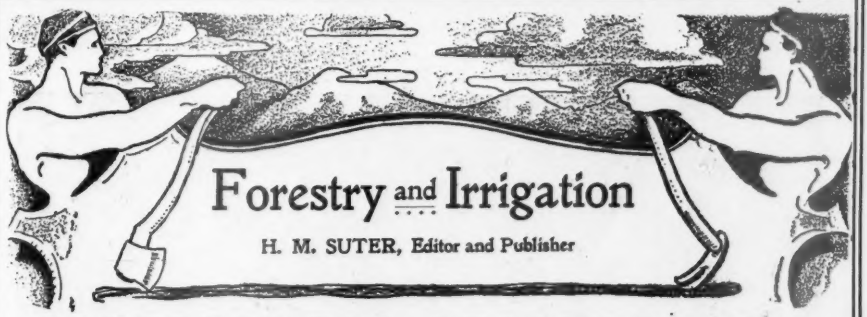
2. The preservation and development of our national resources by the construction of storage reservoirs by the Federal Government for flood protection, and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction.

3. The construction by the Federal Government of storage reservoirs and irrigation works wherever necessary to furnish water for the reclamation and settlement of the arid public lands.

4. The preservation of the forests and reforestation of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies.

5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.

6. The holding of an annual Irrigation Congress, and the dissemination by public meetings and through the press of information regarding irrigation, and the reclamation and settlement of the arid public domain, and the possibilities of better agriculture through irrigation and intensive farming, and the need for agricultural education and training, and the creation of rural homes as national safeguards, and the encouragement of rural settlement as a remedy for the social and political evils threatened by the congestion of population in large cities.



Forestry and Irrigation

H. M. SUTER, Editor and Publisher

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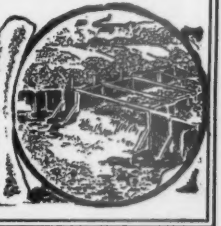
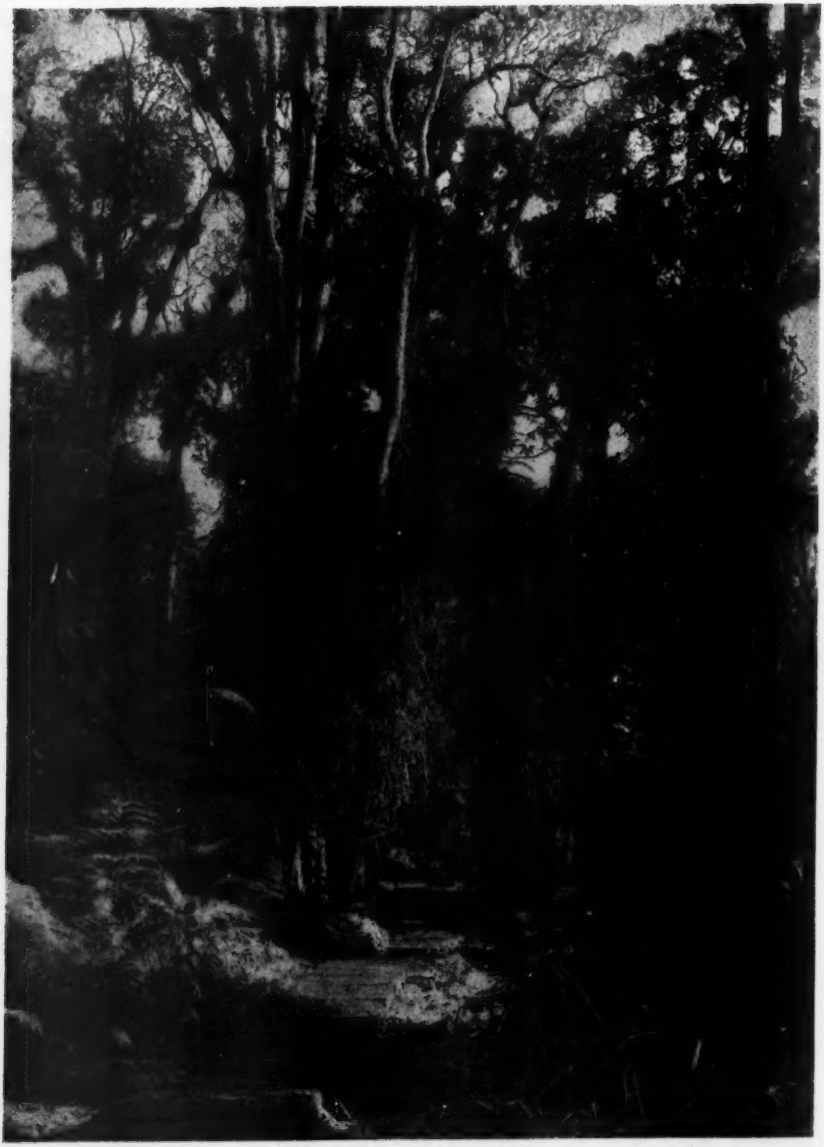




TYPICAL FOREST OF OHIA LEHUA IN REGION OF HEAVY RAINFALL, HAWAII.

Forestry and Irrigation.

VOL. IX. DECEMBER, 1903. NO. 12.

NEWS AND NOTES.

Land Stealing Must Stop. From President Roosevelt's latest message to Congress:

"By various frauds and by forgeries and perjuries, thousands of acres of the public domain, embracing lands of different character and extending through various sections of the country, have been dishonestly acquired. It is hardly necessary to urge the importance of recovering these dishonest acquisitions, stolen from the people, and of promptly and duly punishing the offenders."

Public Land Commission. In the foregoing statement the President, in his customary frank and forceful way, has gone to the bottom of a great abuse. As has been pointed out in these columns from time to time, the people's heritage, contained in the public lands, has and is being wasted in a most glaring manner. President Roosevelt has called the attention of Congress to this matter before, and the emphasis in this latest message is the result of further study of the question and his further recognition of the need of a change in present methods of disposing of the public domain. His appointment of a commission to prepare definite information on this matter for the use of Congress will insure those holding opposite views of the question a fair deal. The commission consists of ex-Governor Richards, now Commissioner of the General Land Office; Gifford Pinchot, Forester of the Department of Agriculture, and Frederick Haynes Newell, Chief Engineer of the United States Reclamation Service, of the Geological Survey.

It is doubtful if the President could have made a better selection. Ex-Governor Richards, as Commissioner of the General Land Office, is naturally a member of this body. He is a western man with an intimate acquaintance of that portion of the country in which the great bulk of the public lands are located. Mr. Newell and Mr. Pinchot enjoy the confidence of the people generally; they have developed their respective bodies of the public service with splendid ability and both are active in fields that touch directly on the question at issue. Mr. Pinchot in his duties as Forester has intimate acquaintance with the question, and both from study of the public-land question and wide travel in the West is exceptionally well fitted for a place. Mr. Newell has shown his abilities in organizing the government irrigation work along such careful lines. He has traveled in and studied the West for years, and probably has a better knowledge of its conditions as a whole than any one man in the country. The President deserves the thanks of the nation for his strong and timely stand on the public-land question, and his knowledge of and interest in the matter is shown by the unusually capable commission he has selected. These men having been selected for their ability, impartial feelings in the matter, and especially for their wide knowledge of the question, means that instead of the usually long wait for a protracted investigation that is usually the case with commissions, that Congress will get a careful and intelligent report in a reasonably short time. In other words, it looks as if at this session of Congress the whole matter will be thoroughly aired;

that the changes in the land laws that have been so long needed will be made. The President's plan suggests an early solution of a very grave problem, and one of importance to the entire nation.

Gouging the Government. That was a funny little comedy that ran in the daily papers recently on such a very uninteresting subject as ordinary cement. One day we were told that Congress was to be appealed to by certain manufacturers in order to stop the officials of the Interior Department from manufacturing cement for use in building the great government irrigation works in the West; the claim being that it was unfair for the government to compete with private enterprises, when their cement trust was ready to furnish all the material needed at a raise in price of only about 200 per cent. After learning the strength of the government's position, and that the public took no stock in their cry of the danger of its competing with individual efforts, these same "protesters" suddenly discovered that it was only certain "wicked trust" men that had raised the prices; they would be very glad to furnish the cement at the price the government could manufacture it. This is only another example of the sort of unwritten law that exists in this country, that there is no harm in overcharging the government. Luckily in this case the would-be grafters collided with the wrong men, for the Reclamation Service is composed of honorable, practical men, who put the great work they are doing ahead of all private considerations.

From Our Letter File. "My father came to this country in 1856, bringing me with him as a boy of five years. At that time the country was covered by a heavy forest of White Pine and other timber cutting from 40,000 to 100,000 feet per acre.

"I am now 52 years old, and in that short space that magnificent forest has been entirely swept away.

"They say we have plenty of timber in the South and West. I have traveled over most of the South, and I have failed to fine any considerable body of timber that would average 10,000 feet to the acre.

"Now, if it only took 50 years to destroy our vast northern forest, 25 years more will see every stick cut south of Mason and Dixon's line, unless some definite action is taken to prevent.

"GEORGE R. WOODWARD,
"*Penfield, Pa.*"

"It is very firmly my idea that the question of forestry should be a national question, and one of the leading matters engaging the governments of both the United States and Canada.

"Private individuals may help agitate; but, for effective work, it should be taken up by the governments.

"WM. C. EDWARDS,
"*Lumber Manufacturer,*
Rockland, Ontario."

"We talk and teach how to *manage a forest*, when, aside from some portions of the Southern States, this great country has practically only small patches of real timber east of the Rocky Mountains.

"What our countrymen need to be taught is, first, that the country will soon experience a lumber famine, which is inevitable, but may be ameliorated by careful husbanding of remaining resources; second, that reforestation is not only possible, but feasible and practical. The land-owner knows that tree planting is the only certain remedy, and he will gladly listen to any explanation of methods.

"We are flagging a train that has gone by. Lumbermen look upon our efforts as wide of the mark.

"Irrigation, applying as it does only to the West, flaunts the red rag in the face of the bull. I shall not be surprised if an opposition to that scheme springs up in the Middle and Eastern States, unless an equal amount of money is devoted to them for replacing their forests.

"S. B. ELLIOTT,
"*Reynoldsville, Pa.*"

FORESTRY AND IRRIGATION is indeed failing of its mission if its readers

do not thoroughly understand by this time that a shortage of lumber will be at hand not many years hence, judging by our resources and present rate of consumption. This matter has been carefully treated by capable observers in the pages of FORESTRY AND IRRIGATION from time to time. Almost every number of every lumber trade journal makes some reference to this well-recognized fact.

As to reforestation by planting on a large scale here in the East, it has not been our experience that owners of denuded forest lands, as a rule, are inclined to welcome the idea, excepting perhaps in a few instances on the worn-out New England farms. The reason for this state of affairs is obvious. They are not yet prepared to allow that such an undertaking is feasible and practical to individual land-owners on the basis of dollars and cents. The profits in prospect do not warrant the employment of their capital in this way at present.

Such questions of economics solve themselves sooner or later. When the demand becomes sufficiently pressing, capital will undertake the production of supply, and not until then. This statement, of course, does not argue that planting is not already practical for the federal and state governments and for corporations, which can afford to look to the future for their profits.

There is no adequate reason why the Central and Eastern States should oppose the fostering of great irrigation projects in the West by government means. Such a course could only be prompted by short-sighted sectional jealousy. A benefit such as general irrigation promises to the West will prove an actual benefit to all sections of the country.

Foresters' Club at New Haven. The members of the senior class at the Yale Forest School constitute an organization known as the Foresters' Club. The men meet weekly for discussion of matters which pertain to forestry or are of associated interest. This influence is valuable for instruction and drawing the men together.

Professor Graves, Professor Brewer, and a few other gentlemen prominent in the forest movement have lately made addresses before the club. Edward A. Bowers, secretary of the American Forestry Association, spoke November 19 on the subject of our National Forest Reserves.

Porcupines Menace Forest. It is reported from Wilkesbarre, Pa., that 20,000 acres of the best timber in the state, situated on North Mountain, is suffering such serious damage by porcupines that expert hunters have been employed to exterminate them.

In two days the hunters trapped and shot 21 of the animals, which are so numerous that many acres of trees have been killed within a few months past. The pocupines gnaw the bark from the trunks of the trees, sometimes for a distance of 10 feet from the ground. The trees are frequently completely girdled, and thus eventually destroyed.

Strength of American Timbers. Timber tests to determine the strength of the principal American timbers used for construction purposes are now in progress at Washington, D. C.; at Yale University, New Haven, Conn.; at Purdue University, Lafayette, Ind., and at the University of California, Berkeley, Cal. These tests are made under the direction of the Bureau of Forestry, and are for the benefit of lumbermen, construction engineers, and scientific men who are interested in the strength of different wood fibers. The Bureau of Forestry plans from the results of its tests to make tables of the strength of different American woods to which the engineer may refer when he wishes to know what timbers to use for certain purposes. The tests will be in cross bending and breaking, compression with and against the grain, and shearing.

No complete and satisfactory series of tests on large sticks of timber has ever been made in this country. Lumber manufacturers in the South and the Pacific Coast States are especially inter-

ested in this work, since they wish to know more about their product. They have contributed gratis much of the material used in the tests.

The chief timbers now being tested are the southern pines and the Red Fir of the Pacific coast. In the laboratories at Washington tests are now in progress on Loblolly Pine sticks 17 feet long and 8 by 14, 8 by 8, and 8 by 4 inches. Special attention is given to the effects of moisture on the strength of wood. In the case of Loblolly Pine which has grown rapidly, the strength was found to decrease 50 to 60 per cent after the dry wood had been soaked several days in water. The fact, however is not yet established and will have to be proved by further experiments. The timbers tested are of the usual grades purchased in the market and are not selected pieces.

At the laboratory of the Yale Forest School in New Haven small selected pieces of Longleaf Pine, without knots or other defects, are being tested so as to learn what is the ultimate strength of the fibers.

At Berkeley, Cal., tests are being made on Red Fir from timbers contributed by Red Fir manufacturers.

Dr. W. K. Hatt, who is stationed at Purdue University, is carrying on a series of tests there with hardwood timbers and is preparing for publication the results of all the tests of the Bureau.

Irrigation Convention Wanted. Interest is being roused by W. N. Wooldridge, Secretary of the Montana delegation to the Ogden Irrigation Congress, which it is hoped will result in an irrigation convention at Helena about December 15.

It is believed that a large delegation of business men from St. Paul, Minneapolis, and Duluth would attend such a meeting, and that James J. Hill would consent to take part in the proceedings, as he did in the recent convention at Bismarck, N. Dak.

Subjects mentioned for consideration are: Changes needed in the present water laws; coöperative irrigation canals and laws designed to encourage them; the encouragement of outside capital for investment in irrigation enterprises and laws for its protection; consolidation of small canal companies; conservation of water and stoppage of waste; the acre unit of the irrigated farm; the most profitable employment of irrigated land.

Turpentine Industry. The discovery of a new way of extracting turpentine, made two years ago by Dr. Charles H. Herty, working under the direction of the Bureau of Forestry, is resulting in a complete change of methods by turpentine operators all over the South.

In a bulletin published last spring by the Bureau of Forestry the claim was made that the experiments with the new cup and gutter system of turpentining had resulted in an increase over the old boxing system of 23 per cent in the amount of the product extracted. This figure has now been raised to more than 36 per cent. In other words, Dr. Herty's system, when universally adopted in the South, as it is bound to be sooner or later, will have raised the turpentine production of this country by more than a third, provided the same number of trees are used. Two years ago, when Dr. Herty first made known his discoveries, he put 20,000 cups into operation. Last year this figure was increased to about 400,000. This year a conservative estimate places the number of cups to be used at 3,000,000. The figures give some indication of the rapidity with which turpentine operators are adopting the new system. The change of methods has been so rapid that the pottery company which undertook to supply operators with earthen cups has been unable to keep up with its orders and has been obliged to refuse contracts for over 2,000,000 cups. It is safe to say that the majority of the large turpentine operators in this country have given up the boxing system and will extract their turpentine by means of cups and gutters.

The economic saving of this new discovery is enormous. It not only causes a great increase in the amount of turpentine produced, but it is a most im-

portant factor in saving the pine forests of the South. Every one knows that trees from which turpentine has been extracted by the old method—"boxed" timber it is called—soon die from the wounds inflicted on them. The cup and gutter system, on the other hand, is not fatal to the life of the tree, and does very little damage to the timber.

The Bureau of Forestry has arranged to give the personal assistance of Dr. Herty to turpentine operators who desire to install the new system.

For Pure Water. The problem of pure water supplies, not only for large cities but also for small country villages and settlements, is constantly increasing in importance. It now demands the serious attention of engineers and scientists throughout the country. Except in thinly settled regions, surface streams and lakes seldom furnish pure water, and at a great number of localities dependence is now placed on wells and springs. These are also beginning to

VIEW OF THE LARGEST ARTESIAN WELL IN THE PECOS VALLEY, NEAR ARTESIA, NEW MEXICO. IT FLOWS OVER 3,000 GALLONS A MINUTE.

be used with conspicuous success for the irrigation of rice and other products at many points in the South, where they have been the predominant factor in the development of certain large areas.

In order to call attention to the importance of pure water for public supplies and the value of the wells and springs for irrigation and other purposes, the United States Geological Survey has undertaken to collect information concerning them from all possible sources, and to publish reports from time to time for free distribution to the public. On account of the great expense, it is impossible to visit all localities, and an attempt is being made to obtain the information in part by correspondence. If persons who know of deep wells, whether flowing or non-flowing, or of shallow wells or springs which for some particular reason are of special interest, will write to the Geological Survey at Washington describing them the information will be greatly appreciated. In the published reports credit will be given to those furnishing important information.

Forestry in New Mexico. A party of foresters from the Bureau of Forestry, under the direction of A. F. Hawes, has been employed all summer on the William H. Bartlett ranch, in Colfax county, N. Mex. The field-work has been completed, and a system of administration for the lands is now in preparation.

The Bartlett tract lies at the southern extremity of the Rocky Mountains, in the Varmejo River Valley, and includes 210,000 acres, part of an old Mexican land grant. The owner of the tract, who resides in Chicago, uses it in part as a cattle ranch and summer residence.

The former owners of the ranch retain the right to cut the timber for a definite period of years, and it is Mr. Bartlett's desire that a young forest of the best possible quality cover the tract when these cuttings shall have ceased. Much of the pine land has already been lumbered, though in most parts a sufficient number of seed trees remain to insure reproduction. About fifty years ago extensive fires swept over the mountainous parts of the tract, which were then covered with a mixture of Spruce and Fir. These burned areas have since grown up to a dense stand of Aspen, under which, in most cases, there is a good reproduction of the native conifers.

The Bureau will recommend that fire patrols be established and fire lines be constructed; that those parts of lands covered with young reproduction be fenced in so as to keep out the cattle, and that considerable tree planting be done, chiefly of western Yellow Pine.

The plan will be accompanied by a map showing the location of forest types, proposed fire lines, areas to be planted, etc.

Private Forestry in Adirondacks. Owners of private estates in the Adirondacks may profit by a report made recently by Raphael G. Zon, of the Bureau of Forestry, concerning the management of Mohegan Park, in township 5, Hamilton county, N. Y., owned by J. Pierpont Morgan. Mr. Zon recently made an examination of the forests at Mohegan Park, in response to Mrs. Morgan's request to the Bureau for advice, and has outlined a simple plan for their management which has been accepted and ordered put immediately into practice. Mr. Zon's plan of management so well fits the special desires of other private owners in the Adirondacks that it is apt to have a far wider application than to Mohegan Park.

Mohegan Park comprises 1,550 acres, of which 1,410½ acres are in forest. The forest has never been lumbered, although it has furnished much wood for building and heating the camps. The trees are mainly hardwoods, most of which are past maturity, and would, under a system of forestry for the highest commercial returns, be removed gradually or at once and replaced by a thriftier crop. The owner, however, desires that the beautiful old trees be allowed to stand, so the system of forestry practiced will consist mainly in the removal of dead, dying, unsound, crooked, and other unsightly trees, to-

gether with those trees which are impeding the growth of others more valuable and beautiful than themselves. In other words, the kind of forestry practiced in the park will be one shaped and adapted to the peculiar desires of the owner. It is a kind that appeals very strongly to many owners of small private estates in the Adirondacks, whose interest in forestry lies not so much in the money returns to be obtained as in the improvement in appearance of their forests.

The annual consumption of firewood at Mohegan Park from now on will amount to about 150 cords a year. Heretofore the forest has been cut clear to obtain firewood, so that the cutting has been a menace to the appearance of the park. Mr. Zon will change all this by using for fuel trees whose presence mars the beauty of the woods, thus making the cutting a benefit instead of a source of harm to the forest. Simple rules are given in the report for the selection of trees for removal, how to get the timber out, the area which must be cut over every year to obtain the required amount of firewood, etc. The report concludes with a list of the trees and shrubs found in the park.

Forest Fires. During the last ten days of November reports of forest fires have appeared more frequently than at any time since the widespread and destructive fires of last spring.

Damage is noted in the mountains of North Carolina and Kentucky, in Minnesota near Cass Lake, and in the Indian Territory.

Much more injury, however, appears to have been done by extensive fires in Alabama, western Mississippi, eastern Arkansas, and eastern Texas, particularly the latter. It was reported from Dallas November 22 that the pine forests east of Nacogdoches for approximately 100 miles square were being swept by heavy fires, with estimated loss of $1,000,000. Four days later the chief clerk of the comptroller's department at Austin announced that the fires were not as heavy as had been reported, and that the property loss would consequently not be as great as was feared.

A wreck in the railroad yards at Austin November 25 resulted from the dense smoke which enveloped the town.

Mobile and Vicksburg at the same time were subjected to annoyance from clouds of smoke passing southward, the fire approaching as near as four miles from the latter city.

A Mississippi packet plying from Vicksburg lost her bearings in the smoke and was stranded.

To Preserve the Big Trees. The following letter has been sent out by the Outdoor Art League of California:

"A bill for the purchase of the Calaveras Big Trees of California by the government was presented in Congress, November 17, 1903, by the Hon. J. N. Gillette, Hon. J. C. Needham, and the California delegation.

"Former bills were approved by the Public Lands Committee, and were passed by the Senate. These bills, however, failed to secure a hearing in the House of Representatives.

"Therefore the Outdoor Art League has resolved to make the preservation of the Calaveras groves a national affair, and to this end a council is being organized of influential men and women in each state, whose purpose is to aid in forming a strong congressional committee, whose duty shall be to act in conjunction with the California Representatives in devising ways and means for securing the passage of the Big Tree bill.

"Will you become a member of your state council and aid in forwarding the interests of the Calaveras Big Tree bill?

"An immediate response is requested.

"Mrs. Lovell White,
"*Chairman Calaveras*
"*Big Tree Committee.*"

In his annual report Capt. Charles Young, acting superintendent of Sequoia and General Grant National Parks of California, in which many giant trees are located, urges the immediate acquisition by the government of the land in those parks, which is owned by private individuals, who, after

waiting in vain for years for the government to purchase their property, are beginning to cut and sell off the large timber. Where once was a fine forest of these magnificent giants there now is nothing but stumps and sawdust piles.

Water Powers in Maine. The United States Geological Survey has recently completed a survey of the Kennebec River from tide water at Augusta to Moosehead Lake. This survey shows the occurrence and location of a number of fine undeveloped water powers. In almost every place where there are plants in operation from one-half to two-thirds of the power still goes to waste.

At Augusta a 17-foot dam furnishes about 20,000 horse-power, of which only 4,000 horse-power is used. Eighteen miles up the river, at Waterville, two dams use only a trifling part of an available head of 42 feet, and at Fairfield not more than one-tenth of the power of a 16-foot dam is employed. The same is true of the 12-foot dam at Shawmut. At Skowhegan, where there is a fall in the river of 20 feet, only 7,000 horse-power is used.

Between Norridgewock and Madison there are sites that present fine opportunities for power development. For 24 miles above Solon there are a great many rapids and shoals, which have a total fall of 160 feet. Three miles above the Forks, the last settlement up the river, is the first power, on Moxie Stream, with a vertical drop of 85 feet. For 4 miles below Indian Pond the river gorge is very narrow, with walls about 200 feet high. In this distance there is a fall of 190 feet, with several excellent sites for power development. The outlets of both Indian Pond and Moosehead Lake are controlled by crib dams that regulate the water for lumbering purposes.

The survey was made by Messrs. A. T. Fowler, John C. Hyer, and T. J. McMaugh during last summer. In addition to making a complete map plan of the river, showing all the islands and the position of the hills on either side, the party made accurate determinations of the height above the ocean of the top and bottom of each rapid and fall. They left permanent bench-marks on which future surveys may be based. The elevation of Indian Pond was found to be 933 feet and of Moosehead Lake 1,029 feet.

Trees Turned to Opal. Dr. Merrill, Curator of the Geological Department of the National Museum, has just returned from a tour of Montana and the Northwest, where he gathered some interesting collections. Most people have heard of the petrified forest of Arizona, but few are aware of the existence of another petrified forest in Montana, of equal extent and more remarkable than the one in the Southwest.

The Arizona petrified forest is peculiar for the reason that entire trees and logs have been turned to agate by the action of the elements. That of Montana is still more remarkable for the reason that trees and logs have been changed to opal instead of to agate, making a peculiar and beautiful ornamental stone. It is not unusual to find logs and trees converted to agate, chalcedony, silica, and quartz; but, aside from the Montana petrified forest, there is probably not another example of opalized wood in the world.

Dr. Merrill brought back a large number of specimens, which will be placed on exhibition in a few weeks. The collection consists of sections of logs and limbs, in many of which the grain of the wood is discernible. The colors are white, bluish, smoky black, and in every case translucent.

In the White Mountains. The Bureau of Forestry has undertaken the preparation of a working plan for the 10,000-acre tract of the Mount Pleasant Hotel Company, in New Hampshire. The forests on these lands have been heavily cut, and the company desires to put them in the best possible condition both for the benefit of the forests themselves and for the scenic effects.

Timidity Founded on Ignorance. Evidence that the public is deeply interested in the government plans for the reclamation of arid lands is becoming more plentiful every day. It is also becoming apparent that a certain amount of misapprehension exists in several parts of the country regarding the provisions and purposes of the irrigation law. Certain poorly informed persons have hastened to express fears that would never have arisen had they studied the history of irrigation in other lands or the phraseology of the new law.

Wide circulation has been given to a theory that the irrigation of the arid west will ultimately result in its absolute alkalization. One hazy thinker makes the ridiculous statement that "genuinely arid countries" are always "ruined," sooner or later, by irrigation. Can the devil be more damned than he is, in the nature of the case? What may the unhappy state of a "genuinely arid" country be when it has reached the final condition of ruination that is feared?

The theory of the croaker is that the irrigating water will sink a few feet into the surface soil, and then slowly, by capillary action, rise to the surface again and evaporate, lifting with it the salts in the soil, which will settle on the surface and gradually transform the land into an alkaline waste. That some such condition has obtained in certain parts of the country is not to be denied.

The Ample Proof. It should, however, be generally known that there is no cause for serious apprehension in any locality. The problem has been studied both here and abroad, and has been successfully solved. The investigations of the Department of Agriculture, covering over 3,000,000 acres of land, have proved conclusively that ordinary under-drainage, coupled with irrigation and flooding, will reclaim the worst alkali lands. The experiment has been tried by Department scientists in Utah, California, and Arizona, and the process proved simple, cheap, practical, and wholly successful. Surely the proposition of tiling irrigated land for alkaline washing is no more revolutionary than the accepted method of drain tiling used in the Eastern States.

The United States is not embarking on an uncertain venture for which there is no precedent. There is good reason to believe that the irrigating ditch is as old and respectable as the Pharaohs of Egypt or the Montezumas of Mexico. That special problems will arise in this country for which new solutions will have to be thought out may be reasonably expected, but the United States does not stand alone in the effort it is making to reclaim arid territory, and the experience of other nations is surely reassuring and should be instructive. In Egypt, for instance, luxuriant crops of cotton, rice, and grass are being grown to-day on over a hundred thousand acres of irrigated land that has been washed of its excessive alkaline salts by means of systematic draining and flooding. Why should not products suited to the climate of the particular country thrive on any alkaline soil similarly treated?

Others of the Survey's correspondents have discovered that the cost of reclamation will be nearer $20 than $5 per acre, as estimated by some of the Congressmen who secured the passage of the irrigation law, and they insist that the enormous outlay of money which will be required to successfully complete these great works will be an unjust burden upon the nation. These particular members of that lively class who are always "ferninst" the government, whatever its proposition may be, have apparently never read the irrigation law. A perusal of the act would have shown them that the initial outlay for the irrigation works is furnished by the sale of the public lands. This fund is merely invested in these works, the cost of which is prorated among the settlers on the land reclaimed. In other words, it is the beneficiaries alone, and not the poor, hypothetical, tax-ridden average citizen, who will do the burden-bearing. As the settler will have to reimburse the government for every dollar spent in bringing him water, the fund created by the sale of public lands thus becomes an endless chain. As rapidly as one

irrigation work is completed, the moneys received for it will go toward the construction of another, which, in turn, will repay its cost into the fund.

Reclamation engineers have plenty of difficulties to meet, though not the ones imagined by the alarmists. They are gravely concerned over two questions—the colonization of the reclaimed areas and the lack of uniformity in the water laws of the several states. The cause for apprehension concerning the first seems to be but slight, as the American people have not been slow to take advantage of the good things the government has offered in the past. The average value per acre of government land in the United States, according to the last census, is $42 per acre, and the average value of products each year is $15; so that if the initial cost per acre of these irrigation works should be $20, it does not seem reasonable to suppose that farmers will hesitate to invest in these farms.

Winter Field Work. The out-of-door investigations of the Bureau of Forestry do not cease with the coming of cold weather. The scene of action is merely shifted to the Southern States, where in winter the conditions are most favorable for vigorous prosecution of the work, and especially for the health of the men.

The cross-tie investigation, coöperative with the New York Central Railroad, which has been carried on in the Adirondacks under Mr. Waha, will be terminated for this year about December 15.

In California the chaparral work and the fire investigations will continue through the winter under the direction respectively of L. C. Miller and E. A. Sterling.

For more than a month a party of ten men under Mr. Reed has been engaged on a working plan for the Call Lumber Company, near Birmingham, Alabama. The tract contains about 100,000 acres.

Fifteen men left Washington November 30 to resume work on the great tract of the Kirby Lumber Company, near Jasper, Texas. This working plan was begun last winter, but the great extent of the company's holdings prevented completion of the work before next spring. C. S. Chapman, who is in charge, has been on the ground with several men some days in advance of the main party.

A commercial study of Sweet or Red Gum (*Liquidambar styraciflua*) and Tupelo Gum (*Nyssa aquatica*) is under consideration. A party may be sent into South Carolina, on the Santee River, for this purpose at a later date.

Forestry in Our Island Territories. In addition to the reserve work done in the western United States last summer by the Bureau of Forestry, the Luquillo Forest Reserve, in the northeastern part of Porto Rico, was examined by Dr. John Gifford, and a study of forest conditions in the Hawaiian Islands was made by William L. Hall. These studies were carried on so late in the summer that they do not appear in Secretary Wilson's report. Mr. Hall's work, especially, has been widely noted by the press, and articles by both gentlemen, descriptive of their work, have already been presented to the readers of FORESTRY AND IRRIGATION.

R. S. Hosmer, of the Bureau of Forestry, has accepted an appointment under which he will probably sail for Hawaii about the first of January, 1904. His work, which will extend over several years, consists in acting as consulting expert to the Hawaiian Agricultural and Forest Board in regard to the management of the system of forest reserves which is to be established.

Plans to Equalize Water Supply. The origin of irrigation ditches in the lower valley of the Rio Grande is lost, even in local tradition. It is probable that many of them were in use before the advent of the white race. Most of these ditches are operated under the community system, each ditch being held and controlled by owners of the land it irrigates, these usually living together in a village or pueblo.

The farmers, among whom those of mixed Spanish and Indian descent predominate, have followed traditional customs, and show little energy or skill. Their lands are tilled in the most laborious fashion, usually by hand, and the returns are small. The soil is of exceeding fertility when sufficiently watered, and is adapted to the cultivation of almost all the agricultural products of the temperate and subtropical climates.

For a number of years during the irrigating season there has been a shortage of the water supply in the Rio Grande. This marked yearly decrease in the volume of the stream has been the cause of much distress and suffering in the sections of Texas and lower New Mexico drained by this stream, and the valley, once one of the most fertile and productive in the country, is rapidly returning to its original state—that of a desert. The large canals and ditches on the Rio Grande in Colorado and northern New Mexico, which have been constructed in recent years, take from it nearly all the normal flow of the stream, and the condition of the farmers in the lower valley has been growing more serious each year.

The Reclamation Service of the U. S. Geological Survey is now engaged upon a preliminary investigation looking to the amelioration of their condition. A number of storage propositions are under consideration, and a party of topographers, in charge of Mr. J. A. French, is making a contour map of the irrigable lands in the valley in New Mexico, near the Texas line.

Water Supply Problem in Kansas. The work of the U. S. Geological Survey in coöperation with the University of Kansas has been continued, but the field of investigation has been transferred from Kaw River to the Verdigris and Neosho rivers. That part of the state drained by these streams is having the greatest development, and there are problems connected with the water supply which require investigation. Such municipalities as Emporia, Burlington, and Chanute, on the Neosho, and Benedict and Independence, on the Verdigris, have as their only available source of supply these streams. They are, however, being polluted by sewage, mine waters, and refuse from the oil fields, and it will be an important problem in a short time to determine just how the waters of these streams can be utilized for domestic supply. The proposed investigation, therefore, is of the highest economic importance to the State of Kansas.

Irrigation at the World's Fair. It is stated by F. W. Taylor, chief of the Department of Agriculture at the Louisiana Purchase Exposition, that Colorado, Utah, and possibly one or two other states are planning an exhibit of the methods and results of irrigation. A five-acre plot has been reserved for this purpose, and considerable interest in the project is manifested in the irrigating states.

Maine Forest School. Seventeen men are taking work in the forest courses at the University of Maine. Of these, fifteen elect forestry as a major subject. Prof. Samuel L. Spring, a graduate of the Yale Forest School, is in charge of the work, and outlines the courses as follows:

General Forestry.—A course covering the whole field in a brief and broad manner. Three hours a week, fall term.

Forest Botany.—Covering the field of tree life from a botanical standpoint. Accompanied by field excursions for the identification and classification of trees, and by microscopic work on the tissue systems of woody plants Two hours a week class-room, and four hours a week field and laboratory work, fall and spring terms.

Silviculture.—A study of the facts which concern forest growth in its practical and economic relations. Accompanied by laboratory work and practical work in the forest, in thinnings, etc. Two hours a week class work, fall and spring terms, and four hours a week in the spring, laboratory and field work.

Forest Measurement.—A course in theoretical and practical determination of

the rate of growth of trees, and of the amount of timber in trees and tracts of forest. Two hours a week class-room, and five hours a week field and laboratory work, fall term.

Lumbering.—A lecture course on history of lumber operations and description of methods in various sections of the country. One hour a week, fall term. Those who take this course are obliged to spend two weeks in some lumber camp, and to submit a report upon the method of lumbering employed there.

Forest Management.—A brief survey of different methods, viewed from economic and financial standpoints, including the principles of working plans and their preparations. One hour a week. spring term.

The above scheme of studies is open to all undergraduates of the university, and to the more advanced students elective courses are allowed. Certain studies in the general course at the university, such as mathematics and botany, are preliminary to the course in forestry, which is largely given by means of lectures and practical field work.

Mont Alto Forest School. For the following interesting note regarding the recently established Pennsylvania State Forest School we are indebted to Dr. J. T. Rothrock, Commissioner of Forestry in Pennsylvania:

"The forest school at Mont Alto, authorized at the last session of the legislature, is in successful operation. It is not, as some of the papers have put it, a forestry college; it is what might better be called a forest academy. The reason for its existence is to meet the most pressing want that is now apparent in connection with the forest service, namely, that of trained wardens who know how to protect the state lands against fire and depredators, and who are competent at the same time to manage the simpler operations in forestry.

"The pupils are *hired* at $30 per month, which they are expected to earn honestly and fully, the idea of any government 'soft snap' being eliminated by the fact that all of their work is done under the supervision of an intelligent and strict 'boss,' a mountain man who has earned his living handling the axe and mattock all his life. We have thirteen of these young men. They are supposed to be able to do all the work, or at least a greater part of the work, now being conducted on the reservation of 50,000 acres. Most of these men are mounted; all are uniformed and wear the state forest badge. They are sworn in as peace officers on the reservation and the land immediately adjacent in accordance with the act of 1903. These, with the additional wardens who are not at the school, comprise a force of about twenty mounted men, all of whom are sworn in as officers.

"During the fire season, the spring and fall, these young men are constantly on guard, and the arrangements are now so perfect on the Mont Alto Reservation that a strong force of efficient fire-fighters can be on the ground at the shortest possible notice. So much for the labor side of the school.

"The educational part is somewhat as follows: Every evening, Saturday and Sunday excepted, the men study from 7 o'clock to half past 9. In addition to this, they are supposed to have two days of each week devoted wholly to study. At the expiration of two years it is hoped these pupils will have gone through mathematics up to and including surveying; that they will have studied enough of book-keeping to know how to keep their forest accounts; that they will be familiar with the forest laws of the state; that they will be acquainted, in an elementary way at least, with ordinary business forms and methods, and that they will have had a course of practical instruction in nursery work, thinning out surplus timber, estimating rates of timber production, etc.

"They will, of course, be expected to be able to recognize all the different trees and most of the plants that they encounter on the reservation, though it is not possible in the short time at present allotted to give scientific instruction in the biological branches. This, of course, is unfortunate and may be

criticised, but the best must be made of existing circumstances.

"No doubt in the ordinary course of events this academy will develop into something of much higher grade. The department believes that every state forestry officer should not only know what a day's work is, but be able to do it and to direct others.

"The forester who cannot handle an axe in the woods always shows up at a great disadvantage when brought in contact with an American woodsman, and such contact is frequent and inevitable'.'

"Government Soft Snaps." Commissioner Rothrock's commendable determination to allow no sinecures in the Pennsylvania state forest service brings to mind a frequently mistaken public conception of the men who do the government work in forestry and irrigation, and also in other branches of the public service. A widespread impression of the typical departmental clerk is that of a self-important and not overcourteous individual whose most strenuous task is the manipulation of certain mysterious "wires" connected with the permanency of his position, and whose chief anxiety concerns the arrival of the paymaster or the hour of closing the office.

It can not be denied that much foundation for this idea has existed, and that the government departments are not even now entirely purged of this class of workers.

But to assume that the business of the government is carried on to a large extent by such parasites is a serious mistake. The splendid reputation for accuracy and efficiency of the scientific bureaus, such as the Coast and Geodetic and the Geological Surveys, was not built up by snap-seekers and time-servers.

A thoroughly lazy man may manage to keep up appearances within the office hours of nine to four in Washington, but one or two trials at government field work will eliminate him as surely as wax melts before the fire, once the novelty of the life has worn away.

In the Bureau of Forestry, Mr. Pinchot has taken pains on several occasions to warn young men that his branch of the public service promises very moderate salary accompanied by plenty of hard work. In spite of this warning, it may be said that five men have been turned away for every one who received an appointment. It would be difficult, searching the country across, to find a larger proportion of the best class of young Americans in any one enterprise than among the men whom Mr. Pinchot has gathered about him in the Bureau of Forestry, or those selected by Mr. Newell for the Reclamation Service.

Most of them are from good homes; almost all are college-bred, and those who hold the more responsible positions have passed a searching technical examination. That means a good deal, but it is not the final test. They spend from seven to nine months of each year in the field, frequently under circumstances very similar to those of a campaign in warfare.

They suffer from heat on the deserts; they tramp out their last ounce of strength in Maine; they wade waist deep through southern swamps. They have slept on the ground, and lived on scanty fare, and broken their bones, and sickened with fevers, and some of them have died; and they do it lightheartedly, as we like to think American boys would.

In the intervals between their periods of absorbing malaria germs, sleeping in vermin-infested logging camps, and undertaking such "snaps" as swimming down the Gunnison Canyon of Colorado (where a boat could not go and live), they return to Washington, shave, and bathe. It is during these periods that the calculating eye of the tax-payer or the "watch dog of the Treasury" is turned upon them, and owing to the general human resemblance, they may easily be confused with the numerous young men in town who toil not nor spin except at the personal behest of the task-master.

They are seen entering a building with a United States flag flying from the roof. That is enough. The ticks,

and the broken bones, and the last four months of camp fare are not in evidence. "Oh, *he's* only a *government clerk!*" is the cry. There is no redress.

They have only the comforting conviction that millions could not buy their healthy young appetites, and that the following month they will be back at Debsconneague, or the Uncompahgre Valley, or mayhap the Jackson Hole country, where the natives are prone to dub them various unkind things relative to youth, inexperience, and political influence as they appear upon the scene fresh from a Pullman car, but later have been known to acknowledge that the local conception of the government snap is somewhat distorted, and that if this may be taken as a fair sample, they *don't want any in theirs.*

Water for Gila Indian Reserve.

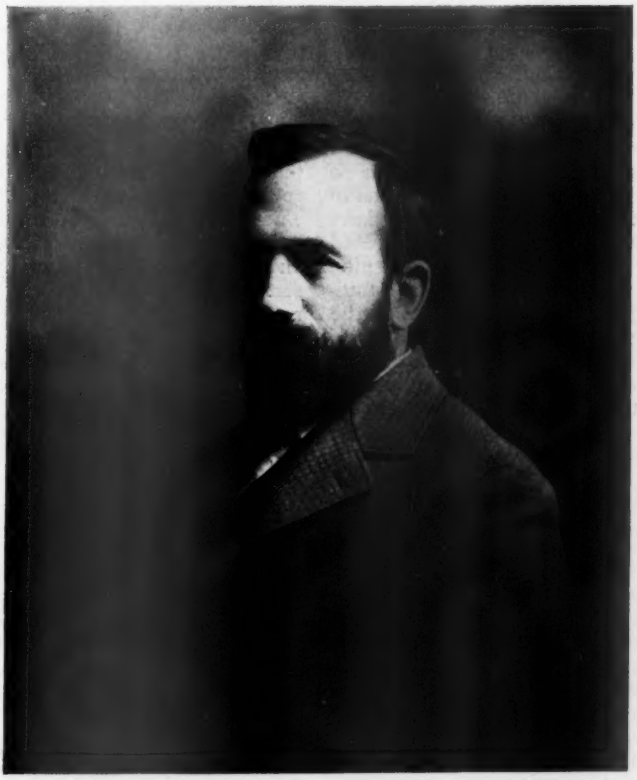
An interesting sequel to what might be called a tribal hegira is contained in the statement that Prof. Willis T. Lee, hydrographer, has been sent by the United States Geological Survey to make a detailed investigation of the underground water resources of the Gila River Indian Reservation, and to ascertain the areas in which the waters may be obtained for the use of the Indians.

It is now seventeen years since the Pimas and the Maricopas were forced to begin their struggle for actual existence, and year by year their condition has become more pitiable. From being a prosperous, independent, peaceful people they have become a starving, thieving, vagabond race. The change began in 1886 with the construction of the Florence Canal, and was later continued by the diversion of water for the Mormon farms farther up the river—projects that from their inception met with earnest opposition on the part of the friends of the Indians.

From time immemorial the Pimas and their blood brothers, the Papagos, had been irrigators. Long before the white man saw this land, their arrow-weed-thatched wickiups had dotted the green river bottoms. Here one generation after another had planted and harvested their wheat and corn, their sorghum and pumpkins, had woven their blankets and baskets, had fashioned their earthenware ollas, and pursued the arts of peace and industry untroubled by fears of drought and famine. The day's work done, they were used to while away the evening hours with a pleasant game of gingskoot.

When the white man came they were proud to be his friend. Never did they join with those restless tribes whose feeling expressed themselves in war paint; never were their hands stained with the white man's blood. On the contrary, they made common cause with the white man against the Apache. About a century ago they were joined by the Maricopas, fugitives from the Yumas, who, like themselves, were an industrious, peace-loving people.

In 1889 the Indians dwelling along the banks of the Gila River and dependent on its lands for sustenance numbered about 6,000. Their troubles were then already upon them. The diversion of their water supply ruined their crops and made their lands worthless. Their homes were abandoned and they themselves became outlaws. Year after year the Indian agent was moved to plead their cause with the government. The result is that they are now wards of the nation; but no yearly stipend could recompense an independent people for the loss of their ancestral lands. It will indeed be good news to them to know that their valley may be made verdant again and their homes thus restored to them. From a preliminary examination that has already been made, it has been ascertained that extensive areas are underlain by sands and gravels containing an abundance of water which can be pumped to the surface. Further investigation is to be made as to the extent and volume of this water in various portions of the reservation. It is expected that electrical power will soon be available for pumping, and by this means considerable land can be brought under cultivation by the Indians.



PROFESSOR FILIBERT ROTH,

DIRECTOR OF THE COURSES IN FORESTRY, UNIVERSITY OF MICHIGAN.

FEW persons interested in forestry in the United States have been longer and more actively identified with this great work than Professor Filibert Roth, director of the courses in forestry at the University of Michigan. He was born in Würtemberg, Germany, in 1853 and came to the United States in 1871. From 1874 to 1882 was spent on the western frontier and 1883–'85 in teaching. He went to the University of Michigan in 1885, where he studied until 1893, and that year he entered the government service as a timber expert in the Department of Agriculture. Professor Roth left this position in 1898 to become a member of the faculty of the New York State College of Forestry. In 1901 he became a member of the Bureau of Forestry, and when the Department of the Interior requested expert aid in reorganizing the forest reserve administration, it was but natural, in view of his long and intimate acquaintance with the far West, that Professor Roth should be assigned to this work. After a year in this field, in which he did excellent service, he returned to the Bureau of Forestry, and a little later accepted the call to return to his *alma mater* and be the director of the courses in forestry. No state in the Union has greater need of care in the management of its remaining forests than Michigan. The University of Michigan, by giving forestry a place in its curriculum, will do much to arouse the needed sentiment among the people, and Professor Roth, through long experience in forest work and intimate acquaintance with the needs of the state, is in a position to give this work the proper force and direction.

THE PRESIDENT'S MESSAGE.

IT CONTAINS STRONG STATEMENTS REGARDING FORESTRY, IRRIGATION, AND THE PUBLIC LANDS.

PRESIDENT ROOSEVELT'S advocacy of the subjects to which this magazine is devoted has been so strong in the past that he has led us to expect new declarations of his views from time to time. His message to Congress must fulfill the most sanguine hopes in this direction, for his statements regarding the disposition of the remaining public lands and the duty of the federal government in matters of forestry and irrigation are not only timely, but show how intimate his acquaintance is with these problems. The recommendations he makes are sensible and practical. The portion of his latest message devoted to forestry, irrigation, and the public lands is reprinted here:

The cash receipts of the General Land Office for the last fiscal year were $11,024,743.65, an increase of $4,762,816.47 over the preceding year. Of this sum approximately $8,461,493 will go to the credit of the fund for the reclamation of arid land, making the total of this fund up to the 30th of June, 1903, approximately $16,191,836.

A gratifying disposition has been evinced by those having unlawful inclosures of public land to remove their fences. Nearly two million acres so inclosed have been thrown open on demand. In but comparatively few cases has it been necessary to go into court to accomplish this purpose. This work will be vigorously prosecuted until all unlawful inclosures have been removed.

REVISION OF LAND LAWS.

Experience has shown that in the Western States themselves, as well as in the rest of the country, there is widespread conviction that certain of the public-land laws and the resulting administrative practice no longer meet the present needs. The character and uses of the remaining public lands differ widely from those of the public lands which Congress had especially in view when these laws were passed. The rapidly increasing rate of disposal of the public lands is not followed by a corresponding increase in home building. There is a tendency to mass in large holdings public lands, especially timber and grazing lands, and thereby to retard settlement. I renew and emphasize my recommendation of last year that so far as they are available for agriculture in its broadest sense, and to whatever extent they may be reclaimed under the national irrigation law, the remaining public lands should be held rigidly for the home builder. The attention of the Congress is especially directed to the timber and stone law, the desert-land law, and the commutation clause of the homestead law, which in their operation have in many respects conflicted with wise public-land policy. The discussions in the Congress and elsewhere have made it evident that there is a wide divergence of opinions between those holding opposite views on these subjects; and that the opposing sides have strong and convinced representatives of weight both within and without the Congress, the differences being not only as to matters of opinion but as to matters of fact. In order that definite information may be available for the use of the Congress, I have appoined a commission composed of W. A. Richards, Commissioner of the General Land Office; Gifford Pinchot, Chief of the Bureau of Forestry of the Department of Agriculture, and F. H. Newell, Chief Hydrographer of the Geological Survey, to report at the earliest practicable moment upon the condition, operation, and effect of the present land laws and on the use, condition, disposal, and settlement of the public lands. The commission will report especially what changes in organization, laws, regulations, and practice affecting the public lands are neeeded to effect the largest practicable disposition of the public lands to actual settlers who will build permanent homes upon them, and to secure in

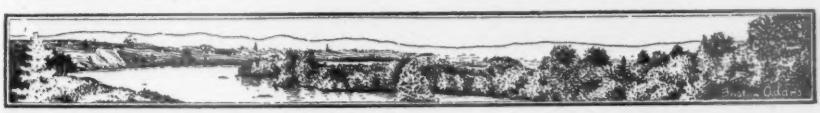
permanence the fullest and most effective use of the resources of the public lands; and it will make such other reports and recommendations as its study of these questions may suggest. The commission is to report immediately upon those points concerning which its judgment is clear; on any point upon which it has doubt it will take the time necessary to make investigation and reach a final judgment.

IRRIGATION.

The work of reclamation of the arid lands of the West is progressing steadily and satisfactorily under the terms of the law setting aside the proceeds from the disposal of public lands. The corps of engineers known as the Reclamation Service, which is conducting the surveys and examinations, has been thoroughly organized, especial pains being taken to secure under the civil-service rules a body of skilled, experienced, and efficient men. Surveys and examinations are progressing throughout the arid states and territories, plans for reclaiming works being prepared and passed upon by boards of engineers before approval by the Secretary of the Interior. In Arizona and Nevada, in localities where such work is preëminently needed, construction has already been begun. In other parts of the arid West various projects are well advanced towards the drawing up of contracts, these being delayed in part by necessities of reaching agreements or understanding as regards rights of way or acquisition of real estate. Most of the works contemplated for construction are of national importance, involving interstate questions or the securing of stable, self-supporting communities in the midst of vast tracts of vacant land. The nation as a whole is of course the gainer by the creation of these homes, adding as they do to the wealth and stability of the country, and furnishing a home market for the products of the East and South. The reclamation law, while perhaps not ideal, appears at present to answer the larger needs for which it is designed. Further legislation is not recommended until the necessities of change are more apparent.

PRESERVATION OF FORESTS.

The study of the opportunities of reclamation of the vast extent of arid land shows that whether this reclamation is done by individuals, corporations, or the state, the sources of water supply must be effectively protected and the reservoirs guarded by the preservation of the forests at the headwaters of the streams. The engineers making the preliminary examinations continually emphasize this need and urge that the remaining public lands at the headwaters of the important streams of the West be reserved to insure permanency of water supply for irrigation. Much progress in forestry has been made during the past year. The necessity for perpetuating our forest resources, whether in public or private hands, is recognized now as never before. The demand for forest reserves has become insistent in the West, because the West must use the water, wood, and summer range which only such reserves can supply. Progressive lumbermen are striving, through forestry, to give their business permanence. Other great business interests are awakening to the need of forest preservation as a business matter. The government's forest work should receive from the Congress hearty support, and especially support adequate for the protection of the forest reserves against fire. The forest-reserve policy of the government has passed beyond the experimental stage and has reached a condition where scientific methods are essential to its successful prosecution. The administrative features of forest reserves are at present unsatisfactory, being divided between three bureaus of two departments. It is therefore recommended that all matters pertaining to forest reserves, except those involving or pertaining to land titles, be consolidated in the Bureau of Forestry of the Department of Agriculture.



HAWAIIAN FORESTS.

A DESCRIPTION OF THE ISLAND FORESTS BASED ON RECENT OBSERVATIONS.

BY

WILLIAM L. HALL,

CHIEF OF THE DIVISION OF FOREST EXTENSION, BUREAU OF FORESTRY.

THERE are two thoroughly distinct types of forest in the Hawaiian Islands. One type occurs near sea-level in the drier portions of the islands and is valuable on account of the timber and other products which it yields. The other type is found on the mountain slopes at elevations of 1,000 to 8,000 feet, where there is a rainfall of 50 to 200 or more inches per year. It has little commercial but high protective value. In no case do the two forests intermingle or meet.

THE ALGAROBA FOREST.

The forest which occurs near sea-level consists of a single species, and this introduced. It is the Mesquite of the Southwestern Plains and is called Algaroba (*Prosopis juliflora*).

The first Algaroba tree sprang from a seed planted in 1837 by Father Bachelot, founder of the Roman Catholic mission. This tree, which is the progenitor of forests of fully 50,000 acres in extent, yet stands in thrifty condition in Honolulu. It is about 2 feet in diameter and 50 feet tall.

On the Island of Oahu the Algaroba forest, covering about 20,000 acres, extends in a narrow but almost continuous belt from the southeastern point, along the south and west coasts, which are protected by the trade winds to the northwestern point. On the other islands it occupies the same relative position, reaching up the low, dry slopes for several hundred feet, often on ground so stony and sterile as to be utterly waste for other purposes. Everywhere it is an aggressive forest and is fast gaining ground.

In Hawaii the species grows in much denser stand, and both taller and straighter than in the United States. Where fully established it shades the ground so thoroughly as to keep out all competitors. The trees become 50 to 60 feet high,

Situated as they are, the Algaroba forests are much more accessible than the mountain forests. The wood has high fuel value and when used as fence posts lasts well in the ground. It scarcely needs saying that these products are in great demand and that there is extensive cutting in these forests. After cutting, the growth renews itself rapidly by both seedlings and sprouts, so that within three or four years it has as complete possession of the ground as before.

A very important feature of the Algaroba forest, and one interesting alike to the forester and the stockman, is that the pods borne by the tree in great abundance are nutritious food for stock. The pods ripen during the summer months and fall to the ground, where they are either eaten direct by the cattle, horses, and pigs, or are picked up to be fed. Forming, with the exception of grasses, the most important animal food in the islands, they are a boon to stockmen, who fatten cattle on them during July and August, when the pastures are usually dry.

Stock do no injury in the Algaroba forests, either to standing trees or reproduction. In eating the pods they do not break the small horny seeds, which pass on through the alimentary system, where they are well prepared for germination. Stock are solely responsible for the rapid and wide extension of this tree.

The Algaroba forests are a valuable asset for Hawaii. They have no ene-

mies, they have tremendous powers of reproduction and extension, and, best of all, they are so highly appreciated for their situation and products that they will be cared for by the individual without special action on the part of the government.

THE MOUNTAIN FORESTS.

These forests are irregularly distributed at elevations between 1,000 and 8,000 feet. Their quality, growth, and even presence are strongly influenced by the northeast trade winds, which during the greater part of the year keep the windward mountain slopes saturated by frequent rains. Where the rainfall is heaviest the forests are densest.

Sugar cane, the all-important crop in Hawaii, occupies the land from a few feet above sea-level to 2,000 feet elevation, and is present wherever there is cultivable land in considerable bodies and an accessible supply of water. Almost without exception, where there was forest under these conditions it has been cleared and the land devoted to cane. Above the cane fields the plains and gentle slopes are often desirable grazing lands, and are commonly used for that purpose; so that much of the land between the elevations named is not forested at all.

The islands of Hawaii and Maui are the only ones having elevations above the timber-line, which is sharply defined at from 6,000 to 8,000 feet. This is surprisingly low, considering the excellent conditions of soil and moisture which prevail at that altitude in Hawaii. The sufficient reason seems to be that the species composing the native forests are all representatives of the torrid zone, and in these islands, which lie right at the edge of the tropics, find their limit at the low altitude named.

CHARACTER OF THE FOREST.

The purely tropical character of the forest is impressive. None of the familiar trees of the north temperate zone are present. There are no oaks, maples, pines, or spruces. There is one representative each of *Sapindus*, *Sophora*, and *Xanthoxylum*, and two or three of *Acacia*, all differing distinctly from their con-

ALGAROBA FOREST, ISLAND OF KAUI.

A HAWAIIAN KOA FOREST.

geners in the United States. One tree, Ohia Lehua (*Metrosideros polymorpha*), gives character to perhaps three-fourths of the forest, covering the ground either in pure stand or with a small admixture of Koa, Kolea, Kopiko, Kukui, Naio, and Pua.

Seldom does the Lehua form a dense stand. The trees are far apart (see frontispiece), have small, thin crowns, and under varying conditions in the forest grow from 40 to 100 feet high. In the best forests they often reach a diameter of 4 feet, with clear length of 40 to 50 feet. The Lehua trunk is straight, but near the grouud deeply ribbed and frequently divided into several branches. Its wood is of a reddish color, heavy, and in drying checks and warps so badly that it is of little use except for fuel.

Though Lehua trees grow in thin stand, the normal Lehua forest, on account of the abundant and luxuriant undergrowth, is impenetrable, except as one cuts his way with axe and knife. To begin with, many trees support climbers, like the Ie-ie vine, which grows into the crowns and may lace together with rope-like stems the trees

of an entire forest. Then there is the fern growth, marvelous in its variety and luxuriance. With species which range in height from a few inches to 30 feet, grow both on trees and on the ground, and run the whole scale of shade endurance, the ferns do much toward making the virgin Hawaiian forest the impenetrable, dark jungle which it often is. In coves of extreme wetness wild banana to some extent supplants the ferns. Mosses in places cover the ground and tree trunks in a layer several inches deep and grow in great bunches over a foot thick on suspended vines and drooping twigs, giving an appearance of weird drapery.

In such a dark forest it seems anomalous to find the Ohia, a tree of pronounced intolerance, reproducing itself generation after generation. It does so through its singular habit of germinating on the trunks of standing or fallen trees, and especially on the fibrous trunks of the tree fern, which is admirably suited to its needs. Only in these places can it get the light it requires. As soon as it germinates it sends several roots down to the ground, sometimes through as much as 30 feet of space. When the host decays the tree is left standing on its several roots, as before described. The natives have an adage that the Amau (tree fern) is the mother of the Lehua. On the drier mountain slopes the Lehua in some districts relinquishes its predominant place to other species, such as the Naio, Kolea, Kopiko, Koaia, and Koa.

Koa (*Acacia koa*), besides occurring in mixture with Lehua, forms pure stands over several extensive tracts in Hawaii and Maui. This is usually a spreading tree with short trunk, occurring in somewhat scattering stands. Sometimes it reaches a diameter of 8 feet and a height of 75 feet. It generally has the characteristic fern undergrowth. Koa is the one fairly abundant tree of the Hawaiian forests which has any economic value. It is a highly prized cabinet wood, has been so used in the islands, and exported in limited quantities. Considerable quantities of mature Koa yet remain in the Island of Hawaii.

A FORESTED WATERSHED ON THE ISLAND OF MAUI.

Kukui (*Alurites moluccana*), a handsome tree with large silvery leaves pointed like our California Sycamore, characterizes the bottoms and sides of gulches and streams to a height of 2,000 feet. It bears an oily nut which the natives in olden times used for illumination. It has no commercial value now.

Mamane (*Sophora chrysophylla*) is the tree of the high mountains and a useful post timber. On the sides of Mauna Kea, at elevations of 6,000 to 8,000 feet, it is rapidly extending and seems to suffer no injury from heavy grazing.

IMPORTANCE OF HAWAIIAN FORESTS.

It can not be claimed that these forests have great commercial value. But for protecting the mountain slopes, for gathering and distributing a useful supply of water for irrigating purposes, they have a value which, in the opinion of many, is difficult to overstate.

They lie directly above the canefields, in many places cover steep, even precipitous slopes, receive from 50 to 200 or more inches of rainfall per year, and are of such character as to hold in suspension a tremendous quantity of water.

The land which depends upon them for a regular supply of water produces, in sugar and rice, crops of immense value. In 1902 the sugar exported from the islands amounted to $23,922,300, nearly 97 per cent of the total exports. Sugar is the sustaining crop of the islands. Other industries flourish largely because the sugar industry exists.

Large tracts suitable to sugar cane lie out of use because there is no water supply for them.

Many of the lands already producing sugar would be more productive with a more abundant and regular water supply.

In so far as water-sheds have been denuded, the results have been disastrous and quickly felt in the way of dwindling water supply and decreased productiveness of the land.

Among the people who have watched conditions most closely in Hawaii the opinion has gained general acceptance that the forest has a direct influence in increasing the rainfall in certain localities, and indeed it is a fact that the evidence for this conclusion is most convincing. Moreover, it seems possible to demonstrate the fact of this influence by measurement.

RAPID DECREASE IN FOREST AREA.

It is said that the islands were heavily wooded one hundred years ago. Cattle had been introduced late in the eighteenth century and were allowed to run wild without molestation, as their slaughter was prohibited. By 1815 they had increased to such great numbers as to be a menace to the forest, and they have continued so till the present time.

The character of the forest makes it peculiarly susceptible to injury by stock. The tender, succulent undergrowth is easily trampled down, and much of it, notably some of the ferns, ie-ie, and banana, is excellent food for cattle. Yet this undergrowth is a vital part of the forest; without it the ground dries quickly and the shallow-rooted trees soon die. The normal Hawaiian forests are as delicate as the plant life in our greenhouses, and it is not to be wondered at that cattle easily destroy them.

Cattle have not gone through all the forests. Some were inaccessible, some too impenetrable for them to enter far at a time. They have worked around the edges, and year by year have entered further, until in many instances they have gone through the entire forest.

Following the attacks of cattle have come other agents of destruction. Injurious insects have frequently appeared in numbers sufficient to deaden thousands of acres at a time. Koa, the most valuable tree in the islands, has upward of a dozen insect enemies, which threaten its utter extinction.

On many thousand acres of forest land opened up by cattle rank-growing grasses have come in and rendered conditions prohibitive of forest reproduction. Cutting and fire have also greatly reduced the forest area.

Goats were introduced into the islands many years ago, and have been particularly active agents of destruction. Wild pigs, the progeny of stock introduced years ago, have done some damage on

LAND ON RIGHT SIDE OF THIS FENCE HAS BEEN PROTECTED FROM GRAZING FOR SEVEN YEARS; LAND ON LEFT SIDE GRAZED CONSTANTLY.

all the islands. Deer, brought to Molokai in the early sixties, have added their efforts in the destructive work.

With so many forces working its devastation, how could the delicate Hawaiian forests do else than recede rapidly year after year? They have already been destroyed on many thousand acres which should never have been denuded, and are failing now as fast, no doubt, as at any time in the past. The problem which confronts Hawaii is to find means of protecting the forests which remain and of restoring them in localities where their absence will hinder the development of the country.

WHAT SHOULD BE DONE.

Nothing less will be effective toward this end than a carefully worked out system of forest reserves which will include practically all the mountain forests on the five important islands, as well as some potential forest land which has been denuded. This should be the first step taken, and should be taken as quickly as possible. The Hawaiian land system is such that each of the reserves will have to be made, a section at a time, by the territorial government exchanging with individuals, wherever necessary, both leasehold and fee-simple lands for the portions it desires to protect as forest. The territory owns 1,700,000 acres, of which the forest reserves when completed should probably include 700,000 acres.

As soon as the reserves are formed all cattle should be driven out, and the

portions which are accessible to cattle should be fenced. Those wild cattle which cannot be driven out and the wild goats should be shot. An effective ranger service should then be put into operation to keep stock and fire out of the forest.

With the reserves well protected, the forest will replace itself on many of the damaged areas, as reproduction under some conditions takes place rapidly. Where it will not replace itself, planting will be necessary, and can be done with direct profit to the islands, too, if commercially valuable species are made use of and are planted in the right situations.

It will be a fine problem for a forester to determine what some of the valuable temperate zone trees like the Redwood and Red Fir will do under the promising conditions which prevail on the high slopes.

PROPOSED FOREST SERVICE.

The people of Hawaii are fully alert to the impending danger to the islands from the decadence of the forests. Last spring the legislature passed a bill providing for an efficient forest service, to be under the charge of a superintendent of forestry and directed by a board of agriculture and forestry. A system of forest reserves which are to be protected by fences and patrolled by rangers is provided for, as also is the maintenance of nurseries and the necessary planting. An appropriation of $28,000 per year has been made to carry the work into effect.

The personnel of the board is all that could be desired. It is composed of business men, who have already taken time, and are willing to take time in the future, to give the needs of forestry the most careful attention, and who are thoroughly capable to undertake the responsible work before them.

The Bureau of Forestry will stand in an advisory position with the board, and at its request has provided a trained forester for the position of superintendent of forestry.

A more responsible and attractive field than this has not been opened in American forest work. The immense importance of the forests, their quick response to improved treatment, the great opportunity to enhance the value of the forest by the introduction of valuable timber trees, the perfectly definite work to be carried out in the formation of the reserve system, and the moral and financial support which are assured to the forester who handles the work well make the field an exceedingly good one.

RELATION OF FEDERAL AND STATE LAWS TO IRRIGATION.

BY

MORRIS BIEN,

UNITED STATES GEOLOGICAL SURVEY.

AS a result of our form of government we have a condition in the arid region, as in other sections, which, if not so familiar, would be regarded as very remarkable, namely, that of two distinct sovereignties operating in the same jurisdiction—the government of a state and the government of the United States dealing independently with different subjects in the same locality, and likewise with the same subject in more or less distinct spheres of action.

This condition must be considered in dealing with irrigation law. Nearly all the lands of the arid region were originally under the sole jurisdiction of the United States. A considerable portion has since become subject to the laws and regulations of the state governments.

In each state or territory we find two

separate sets of laws governing water rights and irrigation—the federal laws few and general in application, the local laws in some cases voluminous and complicated, dealing with the details of the subject. The federal laws comprise the following:

First. The principle of priority of appropriation of water as distinguished from the common law of riparian rights. In 1866 Congress recognized the doctrine of appropriation of water as then applied. By the Desert Land Act of 1877 the waters from all sources of supply on the public domain, except navigable waters, became subject to appropriation and use for irrigation, mining, and manufacturing purposes.

The second great principle of irrigation law, namely, that the water used for irrigation should be appurtenant to the land upon which it is used, while not distinctly announced in the Desert Land Act of 1877, is at least implied in its provisions, inasmuch as the reclamation by irrigation of the lands entered is the main requirement for obtaining a patent thereunder. This principle was, however, definitely announced by Congress in section 8 of the Reclamation Act of June 17, 1902, in the following terms:

* * * "That the right to the use of water acquired under the provisions of this act shall be appurtenant to the land irrigated, and beneficial use shall be the basis, the measure, and the limit of the right." * * *

These two principles are substantially the whole of the Federal irrigation law as enacted by Congress. The same principles form the basis of the irrigation legislation of the various states and territories in the arid region.

Two general systems of state irrigation law have been developed. One, as in California, providing merely for the filing and recording of claims to water, the rights of the claimants depending in general on priority of appropriation, leaving all matters of regulation and adjudication to the courts. The other, as in Wyoming, providing for the regulation, control, and adjudication of water rights by a state board, with a final review by the courts. Between these two extremes we find the power of regulation, control, and adjudication in the first instance, given in varying degree to a state engineer or other officer acting in a similar capacity. In some of the states, where only part of the area is arid, the common-law doctrine of the rights of riparian owners and the doctrine of prior appropriation are applied to the same stream, producing a conflict of interest which has given the courts much difficulty. Under such conditions the rights to the use of water are insecure, and irrigation development proceeds under a serious disadvantage.

A plain statement of the unsatisfactory condition of state legislation is found in the message of President Roosevelt of December, 1901. At the session following this message the Reclamation Act was passed, and the operations thereunder will bring about a situation emphasizing the necessity for proper state irrigation legislation so strongly urged by the President.

The control of the federal government over the public lands and the nonnavigable waters is that of a proprietor, and the irrigation laws enacted by Congress prior to the Reclamation Act have not been intended to impress conditions of ownership upon the lands after they had passed from its control. Accordingly those laws have not been held operative after the issuance of patent transferring title to the individual, at which time the state laws became applicable. Consequently there has hitherto been no conflict of laws relating to this subject.

Under the Reclamation Act, however, the right to the use of water is dependent upon conditions existing before as well as after the United States has divested itself of the title. In some of the states there can be no conflict on this point, because their laws and the decisions of their courts are in harmony with the principles announced in the federal legislation. In other states the local laws and decisions are not in harmony with these principles, but no difficulty is to be apprehended, because the conditions on which the right to the use of the water is acquired are plainly defined by the federal law providing for the grant of the water right.

The operations of the Reclamation Service are national in scope, and are carried on with a view to the best ultimate development of the available water supply; so that state boundaries must necessarily be disregarded. We are here confronted with a question in which the jurisdictions of three or more sovereignties may be involved. This matter has not yet received much attention from the courts, but we have had a declaration of the basic principles involved in a few cases. In the case of United States *vs.* Rio Grande Dam and Irrigation Company, decided by the Supreme Court of the United States (174 U. S., 690–703), the general proposition was announced "that in the absence of specific authority from Congress a state can not by its legislation destroy the right of the United States, as the owner of lands bordering on a stream, to the continued flow of its waters, so far at least as may be necessary for the beneficial uses of the government property."

In the case of Howell *vs.* Johnson (89 Fed. Rep., 556), involving water rights on Sage Creek, which flows from Montana into Wyoming, the United States circuit court said:

"The national government is the proprietor and owner of all the land in Wyoming and Montana which it has not sold or granted to some one competent to take and hold the same. Being the owner of these lands, it has the power to sell or dispose of any estate therein or any part thereof. The water in an innavigable stream flowing over the public domain is a part thereof, and the national government can sell or grant the same or the use thereof separate from the rest of the estate under such conditions as may seem to it proper."

In the very recent case of Willey *vs.* Decker (73 Pac. Rep., 210) the supreme court of Wyoming, considering the case of an interstate stream, held that the doctrine of priority of appropriation would apply to such streams without regard to state lines.

It is not probable that any serious difficulties will arise in the development of the water supply and the application of the water to the reclamation of lands in cases where interstate waters are concerned, for the reason that the aim in all cases will be to make the best possible use of the waters from both an engineering and an economic standpoint, while the legal principles involved are capable of easy solution.

The operations of the Reclamation Service will require a careful comparison and analysis of the irrigation laws of the various states and territories in their application to actual conditions, and we may therefore expect a showing as to the advantages and defects of the different systems. One result to be anticipated from the experience of the Reclamation Service is that a method of dealing with these matters will ultimately be evolved that shall afford a solution for many of the difficult problems confronting legislators in dealing with this subject and produce a code of irrigation law adaptable to the varying conditions, which will amply protect the individual irrigator in his rights and open the way for the development of irrigation interests on a substantial basis.

The ideal of attainment in the minds of most writers and thoughtful students of the subject is the establishment of a community system of management and operation under the control of the water user, with a guarantee of a reliable water supply, an indefeasible water right, and an interest in the entire irrigation system, with the opportunity to work out the highest agricultural development of the community. Something has been attempted in this direction by the various district irrigation laws, with comparatively small results.

The Reclamation Act, however, offers an opportunity for an advance toward this ideal under the auspices of the government, with a promise of good business management and an assurance of justice and fair treatment for all. It therefore behooves all who have the best interests of irrigated America at heart to work in harmony with the government along the lines of operation of the Reclamation Act, so carefully modeled on past experience, toward the attainment of this high standard of irrigation development.

FORESTRY AT THE WORLD'S FAIR.

AN OUTLINE OF THE EXHIBIT TO BE SHOWN AT ST. LOUIS NEXT YEAR.

THE forest interests of the United States, as well as those of foreign countries, are to be well represented at the World's Fair to be held at St. Louis next year.

The Palace of Forestry, Fish, and Game, designed by Mr. E. L. Masqueray, Chief Designer of the Division of Works, is an imposing structure, 600 by 300 feet in extent and covering an area of four acres. It will be completed during this month at an expense of $175,000. Interesting features of this building are the great aquarium and enclosures which will contain the live fish and game exhibits of many states. In the center of the building is a marine pool 40 feet in diameter and 5 feet deep.

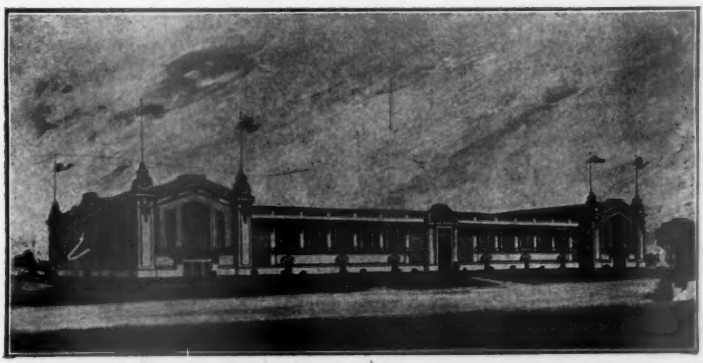
The forest resources, as well as the fish and game of most of the states and many foreign countries, will be exhibited in this structure. The exhibit space will be supplemented by many acres of outdoor area for displays of tree planting, forest management, live game, and other features. That this portion of the World's Fair will be a success is assured from the unusual demand for space for exhibits.

About twenty states and territories and a number of foreign countries (notably Germany) are to participate in the forest display. The Bureau of Forestry will occupy a large central location at the west end of the building.

The indoor display will include a series of large colored transparencies prepared from photographs of trees and various conditions of forest growth and topography in the United States. Typical methods of lumbering will be illustrated, and the damage done to the forests by fire, insects, and the other common causes of injury.

Methods and results of timber testing, preservation of timber, such as railroad ties, by chemical treatment, and improved methods of turpentine orcharding will be exemplified. Upon a large relief map of the United States will be indicated the location and extent of all the state and federal forest reserves, and the types of forest which occur in various parts of the country. The yield and consumption of American timbers will be made the subject of graphic illustrations.

Besides the usual features which have characterized the forest exhibits at other expositions, special attention will be given to full illustration of the economic uses of our best trees, such as the pines, Cedar, Cypress, Redwood, Spruce, Fir, Hemlock, and the more valuable hardwoods.



FORESTRY, FISH, AND GAME BUILDING AT THE WORLD'S FAIR.

Out of doors, in addition to practical examples of the operations of forest management, the Bureau of Forestry will demonstrate the most approved ideas in regard to plantations of forest trees. An area of about 2½ acres has been assigned for this purpose.

The planting of hedges, windbreaks, and timber belts, which have proved so advantageous in prairie country, will be illustrated upon a model farm, the dimensions of which are as one to ten compared with a regular settler's claim of 160 acres.

This tiny farm will be complete in its appointments, and designed to suggest the most economical and convenient utilization of all the land on a homestead.

The value, as well as the proper choice, arrangement, and care of trees, in the Western States will become evident to the visitor who notes the gain in crop protection and wood supply which may be secured with little encroachment upon the fields.

On the four sides of the farm will be planted a hedge, thickly set and woven together. Such a hedge would eventually form a most efficient barrier, and would prove valuable as a moisture conserver and an object grateful to the eye. Trees useful for wood and shade are to be planted along the entire hedge at distances suited to produce the best growth. Red Oak alternates with Cottonwood, Hackberry with Green Ash, Black Walnut with White Elm, and Slippery Elm with Pecan, each pair being used along one of the four boundary lines.

The farm is divided into six fields, which will be separated by woven-wire fence and closely planted lines of trees. In this case Red Cedar, Carolina Poplar, Black Walnut, Honey Locust, Bur Oak, Hackberry, Russian Mulberry, White Elm, Sycamore, White Ash, and Russian Wild Olive are employed.

Windbreaks are plentifully shown, the entire south and west boundaries being protected by plantations 8 feet 3 inches wide, planted 9 inches apart each way.

Combinations of trees suitable for this purpose in various sections of the country are shown in different portions of these windbreaks.

For the Middle Northern States, Cottonwood, Boxelder, European Larch, and White Elm are recommended.

For the river bottoms of the Central States, equal numbers in mixture of Cottonwood, Osage Orange, Honey Locust, and Hardy Catalpa.

For northern Iowa and southern Minnesota, Scotch Pine, Red Pine, White Pine, and European Larch.

For high prairies of the western Dakotas and Nebraska, Bur Oak, Green Ash, Hackberry, and White Elm, or Russian Wild Olive, Red Cedar, Green Ash, and Bull Pine.

DR. TARLETON H. BEAN, DIRECTOR FORESTRY, FISH, AND GAME EXHIBIT, WORLD'S FAIR.

For the arid western plains south of the 37th parallel, Red Cedar, *Biota orientalis*, Bull Pine, and Austrian Pine. (Russian Mulberry and Osage Orange may be substituted for the pines.)

For arid plains south of the 40th parallel, Green Ash, White Elm, Russian Mulberry, and Black Locust, or Honey Locust, Hackberry, Coffeetree, and Osage Orange.

For river bottoms in eastern Oklahoma, Indian Territory, northeastern Texas, and southeastern Kansas, are used Hardy Catalpa, Black Locust, Pecan, and Sycamore.

For the fertile river bottoms of eastern

Kansas and Nebraska, southern Iowa and Missouri are used Black Walnut, Slippery Elm, Hardy Catalpa, and Coffeetree.

For the eastern third of the Dakotas and the western third of Minnesota are used Bull Pine, Jack Pine, Red Cedar, and White Spruce.

The second feature of the exhibit consists of forty-five blocks, each 25 feet square and planted with sixty-four trees, representing the most advisable choice of species for forest plantations in different parts of the country.

The combinations of species on many of these blocks are quite similar to those in the windbreaks about the farm, being designed mainly for the country between the Rocky Mountains and the Mississippi. Others represent the species used in planting plans for locations of various latitudes and altitudes in the eastern part of the United States. They introduce such species as Norway Spruce, Balsam Fir, Tamarack, White Oak, Chestnut, Sugar Maple, Yellow Birch, Yellow Poplar, Sweet Gum, Loblolly Pine, Ginkgo, and Long Leaf Pine.

In this way a very complete outline is presented of the planting plans which the Bureau has made for land owners in various parts of the country. The total number of young trees required for this work is 14,996.

The third feature of the exhibit is a complete forest nursery, showing the method of growing conifers and deciduous trees from their seeds.

Little trees will actually be grown in the beds, and their daily care and cultivation will be an interesting sight to many visitors.

All the apparatus of the regular private and government nurseries will be provided, such as adjustable screens of lath which shelter the tender seedlings in the beds and provide similar conditions of light and shade to those under which they thrive in the forest.

The directors were fortunate in securing Dr. Tarleton H. Bean to take charge of the forest, fish, and game exhibits. Dr. Bean has had a wide experience in such matters, beginning with the Centennial Exposition at Philadelphia in 1876. He has prepared exhibits in his special field for practically every important exposition since that time, and is well known through his connection with the United States Fish Commission and for his many valuable ichthyological writings.

IRRIGATION INVESTIGATIONS ON THE NORTH PLATTE RIVER, IN WYOMING.

BY

JOHN E. FIELD,

DISTRICT ENGINEER, UNITED STATES GEOLOGICAL SURVEY.

HISTORICALLY, the North Platte and Sweetwater rivers are among the most interesting in the West. The date of the first coming of the white man is unknown. The hunter, trapper, and squaw man had apparently been in these regions many years prior to the date of the oldest written accounts, and gave valuable aid to the various expeditions sent out to report on the country. Fremont here found a path already made and the region well occupied. On one of his visits he delivered a Fourth-of-July oration from Independence Rock, on the bank of the Sweetwater, to five thousand people—Indians, soldiers, hunters, trappers, and emigrants; but were he to hold a Fourth-of-July celebration at the same place today, it is doubtful if his audience would comprise more than half of that number. The great Mormon trail extended up the North Platte and Sweetwater rivers, passing, in fact, through

the proposed Devil's Gate Reservoir site, and the country is rich in tradition concerning this wonderful movement, and one finds no difficulty in retracing their route.

The rush to California in '49 found this the natural highway across the continent. What such a movement means, what numbers must have passed over this now all but abandoned highway, is hard to realize until one sees the trail plainly drawn, though now overgrown with grass, extending across the hills and valleys in places more than one hundred yards wide. Fremont is said to have lost his boats, astronomical and surveying instruments in the canyon of the North Platte near the mouth of the Sweetwater. If such is the case, it is the opinion of the writer that the location of one of the dams under consideration will be very near the point where the disaster occurred. "Before a European ever looked upon it the Platte Valley was for centuries, in all probability, a gateway to the mountains. The prehistoric mound-builders perhaps traveled its lonely course and on through the portals of the great continental divide. The primitive savage of North America traversed this silent trail across the continent." * * * "Until fifty years ago the whole region watered by the Platte was regarded as a veritable desert, never to be brought under the domain of agriculture, but forever doomed to a hopeless sterility. The Platte River, nearly three-quarters of a century ago, was called by Washington Irving 'the most magnificent and most useless of streams.'" But it remains for us to determine whether or not he was right in his statement.

The North Platte River extends from the Colorado line on the south, thence northerly through the Seminole, Ferris, Rattlesnake, and Casper ranges, some 200 miles, receiving in its course the waters of two of its three tributaries—the Medicine Bow and the Sweetwater Rivers. Then it turns and runs south of east to the Nebraska line 200 miles farther, having received in its course the waters of the Laramie, its third principal tributary. The tributary streams in Wyoming, while of considerable length and draining large areas, traverse a territory of little rain or snow-

DEVILS GAP, WYOMING; PROPOSED RESERVOIR SITE OF SWEETWATER PROJECT.

LOOKING DOWN THE NORTH PLATTE RIVER FROM THE NEBRASKA-WYOMING BOUNDARY.

fall, contributing little water to the main stream, especially in the irrigating season, as the flow is then small and practically all the water used for irrigating lands along these tributaries. One might say, therefore, that the supply of the North Platte comes from the mountains surrounding the North Park in Colorado, traverses Wyoming, where little of its water is used, and flows into Nebraska. Here it is put to beneficial uses more extensively than in Wyoming; but it is rare that the river is so low in either state as not to meet the demands made upon it, while vast volumes run to waste during the flood and normal periods of the river. Three states are thus interested in the waters of the North Platte, and some interesting and important questions of control and use are sure to develop.

There are two causes for the non-use of this water: One, the very small fall per mile in the river, which, generally speaking, is from 5 to 7 feet; the other, that the best land and the bodies of good land of any considerable area lie at quite an elevation above the river. These conditions necessitate long canals or expensive dams, or both, and, on account of the broken and eroded condition of the zone lying between the mesas and the river, construction is so difficult and expensive that private and corporate enterprise has found the cost prohibitive. In one case the writer in making a survey found that to give an elevation of 90 feet in a direct line from the starting point and a distance of 15 miles would require the construction of a canal 32 miles long, including some 6 miles of tunnels and 10 or more miles along steep, rocky hillsides. There has been no lack of faith and of effort among the people of Wyoming. They have often embarked in enterprises where a sufficient return on the investment was extremely doubtful, but abundant faith, patience, and intelligent effort has in most cases been rewarded.

The entire region has been thoroughly gone over and many surveys made in the hope of putting the surplus water to use. The steady demand for feed for the stock in winter has put such a premium on irrigated lands that

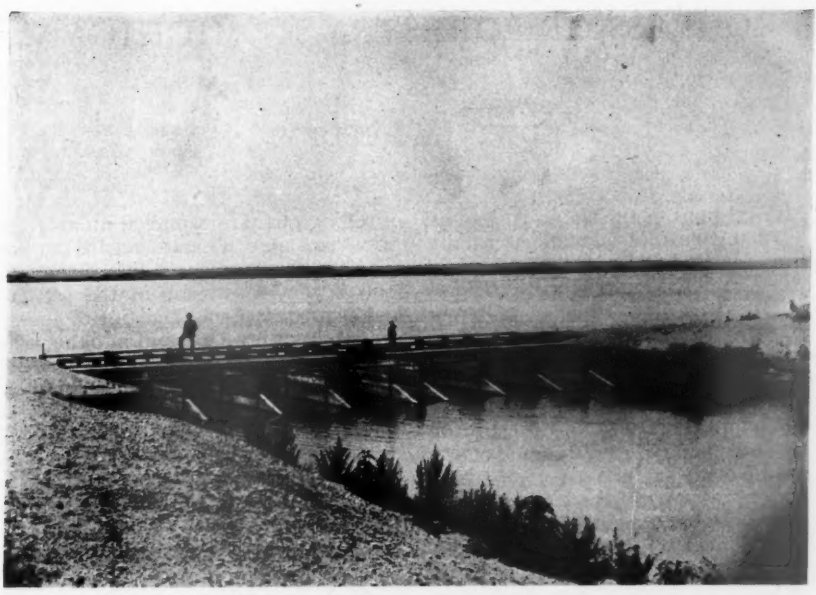
no effort has been spared to increase the cultivated area. One might say all the possibilities of private enterprise have been exhausted, and it remains only for the government to ascertain whether some of the propositions given up by private parties can not be made to pay under the more favorable conditions of the Reclamation Act. Briefly, on the North Platte it is a question of margins only—margins so close that detailed and exhaustive surveys alone can determine the feasibility of any project. Reservoir sites of comparatively low cost per acre-foot stored have already been located by the Reclamation Service sufficient in capacity to store all the surplus flow of the river in a year of normal discharge. Priorities of right in either Wyoming or Nebraska are not such as will interfere with a new canal, and the surplus flow of the river is sufficient to reclaim possibly a half million acres of new land. So vital are the items of priority and supply in most localities that the enterprise is more dependent upon them than upon the cost; but on the North Platte it is simply a question of cost and the acreage covered, of the quality and quantity and value of the land reclaimed. Of the land, it can be truthfully said that its value is greater than the latitude and altitude would seem to justify, for, while the growing season is short, every acre in cultivation means the saving of many cattle and sheep each year. The crop's value is not its selling value, but its value as feed on the land where it is grown in reducing the percentage of losses in winter.

Briefly, the work accomplished during the past season by the Reclamation Service is:

First. A canal survey into Goshen Hole, in the southeast corner of the state, and extending into western Nebraska. The proposed canal will head near the town of Guernsey, on the North Platte, where a diversion dam 100 feet high will be constructed. It will probably cross the North Platte River about two miles below old Fort Laramie by means of an inverted siphon two and one-half miles in length, with a maximum pressure on the conduit of 190 feet. The conduit is to be of concrete steel, in two or more sections, with an aggregate capacity of at least 1,000 cubic feet per second. It will enter the Goshen Hole about seven miles southeast of old Fort Laramie, thence in a curve around the Hole to Horse Creek, and thence some twelve miles into Nebraska, a total distance of 150 miles. The elevation of Goshen Hole is a little over 4,000 feet, surface rolling, soil good and contains little alkali. During the non-irrigating season, water is to be stored in reservoirs in the Hole. The feasibility of the project has not yet been determined.

Second. Primary levels have been run from the Nebraska line to Devil's Gate, a distance of about 400 miles, this line furnishing the data from which all elevations are determined on each separate piece of work. Canal lines have been run from the dam site at Devil's Gate, on both sides of the Sweetwater River, covering all the land possible, about 20,000 acres, which land has been accurately surveyed by means of the plane-table upon a scale of 1,000 feet to the inch, with a five-foot interval. From maps so made the lands will be classified, and the non-irrigable, alkaline, and worthless lands excluded; the balance divided into the proper farm areas ready for settlement.

Third. A reservoir covering some 1,200 superficial acres has been located on the North Platte River, the dam being about three miles below the mouth of the Sweetwater. Preliminary surveys indicate that its capacity will be more than 750,000 acre-feet. The dam will be 80 feet long on the bottom and 200 feet on the top, and will contain about 75,000 cubic yards of masonry. Its height from foundation to parapet will be about 200 feet. The water stored is to be used to increase the flow of the river, when needed for irrigation of lands lying under such canals as the government may construct. The canals being considered at present are the one to the Goshen Hole, already mentioned; one to head at Alcova, some thirty miles above Casper, and which will cover lands to the north and west of that town, and a number of small



HEADGATES OF AN IRRIGATION CANAL ON THE PLATTE RIVER.

canals on either side of the river covering low-lying lands immediately adjacent to the river.

Fourth. The flow of the North Platte and Sweetwater rivers has been ascertained for the past year, giving for the North Platte a maximum of about 11,000 cubic feet per second and a minimum at the proposed dam site of 250 cubic feet per second. For the Sweetwater the maximum as determined was 400 cubic feet per second and the minimum 5 feet. The flow as found in the Sweetwater was particularly disappointing, as the Devil's Gate reservoir is entirely dependent on it for its supply of water, while by the Chittenden report the average flow of the stream as estimated was 319 cubic feet, about the mean flow for the month of June.

Fifth. Drilling for foundations begun July 1 at Devil's Gate site completed the work begun in 1902, and showed an excellent foundation and favorable conditions generally for the dam. The conditions are apparently similar to those at Devil's Gate, and it is expected that equally satisfactory foundations will be found in solid granite. The installation of machinery for boring was extremely difficult at this point, it being necessary to first lower the machinery into the canyon, about one-half mile below the dam site, where barges were built, the machinery loaded on them and towed up the river. It was necessary to blast out boulders at places to allow the barges to pass before the point for beginning the drilling was reached. Two holes had to be drilled extending 18 feet into the bed rock, showing the bed rock so far to be of solid granite and at a depth of 10 feet below water. The work of drilling at this point should be completed before the end of the season, the topographic survey of the reservoir site and dam site should be completed at the same time, and data necessary for the determination of all matters connected with the project gathered. There have been at work during the season since April 1 from one to four parties; these now consist of a level party; two surveying parties, with topographers, level and transit men in each, and a diamond drill outfit. These parties aggregate thirty-five men.

PROGRESS OF FORESTRY IN MICHIGAN.

BY

EDWIN A. WILDEY,

MEMBER OF MICHIGAN FOREST COMMISSION.

FEW regions of the Union possess as many natural advantages as the Peninsular State. Surrounded as it is by the Great Lakes, its climate is equable. Its coast line would reach from Maine to Florida, and the tonnage that passes through the Detroit River exceeds that of any other port on the western hemisphere.

Mountains, lakes, rivers, forests, and mines abound, and through the efforts of man Nature's gifts have placed Michigan first in many of the leading industries, while none excel it in the diversity of the products of its farms, manufactories, and mines. Thousands of beautiful lakes lie scattered over its surface, and the crowds of tourists that throng their borders from early spring to fall are proof positive that the motto selected by our state is an appropriate one: "If you would behold a beautiful peninsula, look around you."

While there has been a constant increase in the wealth of the state and a steady growth in population, it is a lamentable fact that there has been a great waste of natural resources. Especially is this true of the magnificent forests that originally covered the state. Our climate seems peculiarly adapted to the growing of trees and shrubs, for seventy species of indigenous trees and one hundred and fifty native shrubs are found—a display that few localities can equal. With all this wealth of natural resource, it is but little wonder that there has been a prodigal waste of standing timber. In pioneer days the magnificent forests of hardwood that covered the southern counties of the state were regarded as an obstacle to be gotten rid of in the easiest manner possible; so fire and axe were used, and great tracts of the finest oak, walnut, and kindred species of timber were destroyed. Then, too, the insane policy of selling our virgin pine at an average price per acre without regard to its condition has placed certain classes of land beyond the reach of the settler, and as a consequence the tide of immigration has passed beyond into the prairie states, and but one-quarter of the state's area is now under cultivation by farmers and fruitgrowers. In spite of this fact, our other advantages have caused Michigan to rank eighth in population and thirteenth in wealth. What its position would have been to-day had this source of wealth been properly preserved we can only conjecture.

The history of the progress of forestry in Michigan until recently is mainly a record of failures, and the present, full of hope as it is, will need the active support of such stalwart pioneers as the Hon. Charles W. Garfield, president of the State Forestry Commission, and Hon. Arthur Hill, of Saginaw, another member of the Commission. These two gentlemen have been connected with the efforts to awaken interest in forestry since 1881. To no little extent are the people of Michigan indebted also to Prof. W. J. Beale, of the Agricultural College; Professor Spaulding, of the University of Michigan, and Mr. E. W. Barber, of Jackson, for the progress that has been made in forest preservation.

In 1887 the first attempt to enact general forest legislation for the state brought into being a Forest Commission identical in personnel with the State Board of Agriculture. The work of this Commission was hindered by newspaper articles from private individuals who betrayed considerable ignorance of the Commission's purposes and aims. Composed as the Commission was of men whose time was fully occupied with other duties and who already gave much time and service to the state with-

out compensation, there was but little encouragement for them to continue their labor in such an unproductive field. The result of the work of this Commission will be found in their report published in 1888, and in the complete change of sentiment now evident in those who were at the time most opposed to the forestry movement.

Prior to the year 1897 the general public gave but little thought to the lumber industry. The reasons for this apathy are easily seen, namely, that all kinds of lumber seemed plentiful and comparatively cheap; for several years building and other improvements involving the use of timber had been at a standstill, and a dullness prevailed in all branches of this important industry. Meanwhile capitalists were quietly engaged in buying up timbered lands, not only in Michigan but in other localities as well, when suddenly the retail lumbermen became aware of a shortage in the supply. The prophecies of those interested in forestry had come to pass, though not as soon, perhaps, as had been predicted.

The cry went up, "What shall be done to prolong the life of the lumber industry in Michigan?" and as an answer legislation bringing into existence the present Forestry Commission was enacted. The act creating this Commission gave them no authority over any territory for the purpose of reforestation, but authorized the Commissioner of the State Land Office, under the instruction of the Forestry Commission, to set apart not to exceed 200,000 acres. The result was the withdrawal of state lands in twelve townships in Roscommon and Crawford counties. This was accomplished in 1900.

During the session of the legislature in 1901 the Commission sought to have all of the lands belonging to the state north of the south line of Roscommon, Missaukee, Wexford, Manistee, and Iosco counties set apart, and to have enacted such legislation as would perfect the title of state tax lands that had been deeded or that might thereafter be deeded to the state. The session closed with nothing done; but the Commission, undaunted, at the next session again went before the legislature and succeeded in securing an annual appropriation of $7,500 in addition to the $2,000 appropriation already given them.

In addition to this, three townships of land in the territory first withdrawn were turned over to the Commission with full authority to purchase, sell, or rent any tracts within these townships as the Commission might deem proper to dispose of them. Authority was also given to remove, sell to private parties, or cut any tracts of timber, according to the discretion of the Commission.

At present the Commission, with the aid of the United States Bureau of Forestry, is making a preliminary survey of these townships. This survey is under the control and management of Prof. Filibert Roth, of the University of Michigan, who has kindly consented to assist the Commission and to formulate working plans for the future work of the Commission. With this experienced forester in full charge of all the preliminary work, it may be hoped that the future work of the Commission will be productive of the grand results that have been so long sought.

As a result of the agitation in regard to forestry within our state, the University of Michigan has established a Department of Forestry, which will graduate trained foresters, and the Agricultural College has created a Department of Forestry which will give a course in practical farm forestry that cannot help proving a benefit to the agricultural interests of the state. Public attention has also been attracted; public sympathy has been awakened.

The danger of further deforestation is apparent to thoughtful citizens everywhere. Lumbermen are alive to the importance of continuing the supply of raw material. Manufacturers are questioning where their supplies in the future are to come from. Railroads are investigating the problem of how most economically to meet the demand for ties. Those who profit from the great resort industries begin to appreciate the value of the virgin forests as a factor in their business. Sportsmen are thoroughly aroused as to the importance of a permanent forest preserve and a place

of safety for game to reproduce its kind, lest the most valuable species should be completely eliminated from our woods and fields.

Farmers are alarmed by the changes wrought by the loss of the forests, and are studying economic methods of reforestation. Fruitgrowers are feeling keenly the loss of windbreaks as protectors of their interests, and are asking what can be done to restore the conditions that have made Michigan famous as a fruit state. Users of water power understand as never before the importance of maintaining an even flow in our streams, which only forest growth about their sources and along their borders can assure. Navigators and all interested in lake marine have learned that it costs money to dig the annual deposits of silt from the harbors of Michigan, caused in a large measure by the fitful floods which result from the deforested borders of streams which flow into them.

The future policy of the Commission will be along the lines already indicated, and also to interest municipalities and private parties in the growing of tracts of timber. In municipalities the establishment of parks and the beautifying of their streets will be encouraged, while the attention of the farmer will be called to the economic value of his woodlot and the importance of giving it care. Legislation was asked for at the last session of the legislature with these special objects in view, but the efforts of the Commission were unable to bring about any action in addition to what had already been done. The attention of paper manufacturers has been called to the importance of them in the future of a supply of pulp wood, and it is to be hoped that some of the large tracts of sandy lands unsuitable for agriculture will be acquired by some of these large corporations and devoted to the growing of the needed species.

These plans for the future and the record of work performed in the past will, we trust, so commend the Commission to the people of the state that we need fear no danger of that general opposition which alone can limit or nullify its usefulness.

MILK RIVER PROJECT, MONTANA.

DESCRIPTION OF ONE OF THE LEADING IRRIGATION PROBLEMS NOW RECEIVING THE ATTENTION OF THE FEDERAL GOVERNMENT.

BY

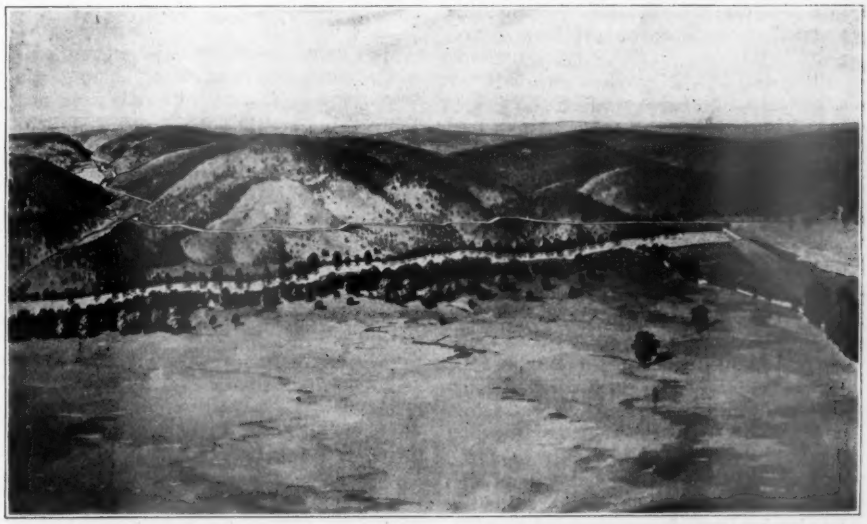
CYRUS C. BABB,

ENGINEER U. S. GEOLOGICAL SURVEY.

IN the northern part of Montana, close to the international boundary, is a section of mountainous country unsurpassed for scenic grandeur. Here are peaks covered with snow the year round, and a little lower down occur the largest glaciers in the United States.

Numerous streams, insured a plenteous supply from the heavy winter snowfall in the basin, descend from these glaciers. Their waters collect in the St. Mary Lakes, which are drained northward by the St. Mary River into the Saskatchewan and finally empty into Hudson Bay.

Milk River, heading in the low-rolling country immediately east of this basin, has a general northeasterly direction, the two principal branches, North Fork and South Fork, uniting after crossing the Canadian line. The stream thus formed flows easterly for 150 miles or more, when it bends to the southward again and returns to Montana, finally emptying into the Missouri River. The broad Milk River Valley in Montana



MILK RIVER IRRIGATION PROJECT. SKETCH OF PROPOSED DAM AND CANAL AT THE OUTLET OF ST. MARY'S LAKE, MONTANA.

consists of a generally rolling country, adapted to irrigation. The water supply, however, from this river alone is insufficient, owing to the lack of high mountain area at the source.

The Milk River, or the St. Mary River project, is designed to store flood waters in the St. Mary Lakes and conduct these waters easterly by a canal cut through the gravelly ridges to the head of Milk River. This canal will, therefore, connect a mountain catchment area to the latter stream.

In 1900 a reconnaissance of the St. Mary Lake was made, and followed during the past three years by more detailed surveys. The investigation has brought out four courses for consideration:

First. Carry water from the St. Mary Lakes to the North or South Fork of Milk River, and allow it to run through Canada to the lower Milk River Valley in Montana.

Second. Carry water from St. Mary in a long canal across country, keeping it in the United States for the entire distance to Sage Creek, a tributary of lower Milk River.

Third. Make the project of a more local character—that is, irrigate the lands of the eastern portion of the Blackfoot Indian Reservation and those immediately adjacent to the eastward.

Fourth. Carry water from the head of St. Mary River across both North and South Fork of Milk River to Cutbank Creek, down which it will flow for 50 miles or more to the Marias River, and then divert from the latter, and carry the water in an artificial channel again to Big Sandy Creek, a tributary of lower Milk River.

DESCRIPTION OF WORKS.

It is proposed to build a low, earthen storage dam at a point about three-fourths of a mile below the present outlet of lower St. Mary Lake. This dam will have a maximum elevation of 55 feet above the bottom of the river, and will form a reservoir with a capacity of about 250,000 acre-feet.

During 1902 an examination was made at the dam site to determine the depth to bed rock, and the character of the rock constituting the same.

Sandstone rock outcrops at the surface at the eastern end of the dam. From this point it drops rapidly to 138 feet below the surface at 1,600 feet dis-

tant from the eastern end. Borings this year show a depth of 187 feet at one point.

The top of the earthen dam will be at an elevation of 4,513 feet above sea-level; both inner and outer slopes will be 3 to 1. It is the intention to use the hydraulic fill method of dam construction. Most of the material will come from the hill west of the dam, as the water to wash it down can be easily obtained from Swiftcurrent Creek by means of a short diversion canal. A concrete core wall will extend from the east abutment of the dam across the river for a distance of 475 feet, where the present depth of bed rock below the surface of the ground is 33 feet. From this point to the western end of the dam a puddle trench will be first excavated and sheet piling driven as far as practicable. This trench will then be filled in by the hydraulic method, and the balance of the dam deposited on either side. The lower toe of the dam will be of riprap in order to prevent the sliding of the material due to any percolation of the water under the dam. The upper face will be riprapped as a protection against wave action.

From the reservoir thus formed water will be diverted through an open cut in rock around the eastern end of the dam. Opposite the end of the dam and connected with the concrete core wall will be located the headgates of the reservoir outlet. This consists of a curved wall of radius 30 feet, placed on four concrete piers. There will be two series of circular openings of 4-foot diameter in the wall—three at a distance of 20 feet below the top, four at a distance of 30 feet below the top. There will be five additional openings at the bottom or between the piers with the dimensions of 5 feet in width by 9 feet in height. Water through all the openings will be controlled by cast-iron sluice gates operated by appropriate gearing.

Eight hundred and fifty feet beyond these reservoir gates there is to be located in the canal a concrete spillway for discharging the waste water into the river and suitable regulating gates in the canal itself.

DESCRIPTION OF THE CANAL.

The canal proper will begin immediately below the headgates. The grade was assumed at two-hundredths of one per cent, or a fall of 1.056 feet per mile. It is proposed to make the bottom width 30 feet, with a 10-foot depth of water and with side slopes of 1 to 1. It is assumed that in a canal of these dimensions the mean discharge at the head will be 1,350 second-feet. From the dam the canal will continue down the east bank of the river a distance of 7 miles, then turn eastward, and pass through a gap known as Spider Lake Gap. Thence it will continue in a general northerly direction for a distance of 27.4 miles, or to the North Fork of Milk River.

The last step in the construction of the canal will be the dropping of the water 180 feet to reach the level of the North Fork Creek. The estimated cost of construction of this portion of the line, dropping the water to North Fork, is $924,070.

LOWER MILK RIVER.

This stream crosses the international boundary, entering the United States for the last time at an elevation of 2,680 feet. It continues in a southeasterly direction for about 60 miles, whence it bends easterly for the rest of its course till it reaches Hinsdale, when it bends southeasterly again until it reaches the Missouri. At Havre the elevation of the river is 2,467 feet, showing a fall from the international line of 213 feet in the distance of 60 miles, or a fall of 3.7 feet to the mile. This portion of the stream is in a deep valley, averaging from one to two miles in width, with bluffs on either side 200 feet, more or less, in height. A canal taken out at the international boundary at the grade of the river would continue down for 60 miles or so until Havre was reached, and then would not be out of the bluffs here. Owing to this length, nearly all of which would be alongside hill, the proposition is hardly feasible. Ten miles below Havre the valley widens, and the relative height of the side bluffs is reduced, and it is here that the first

diversion from Milk River can be accomplished.

At the present time a survey is being made for a canal heading near Yantic on the north side of the river, and continuing down for about 60 miles. It will cover about 50,000 acres, a portion of which is at present irrigated from the private ditches of Milk River. This canal will be a later development of the one described below, and no estimates of cost have yet been made.

MALTA PROJECT.

The original plans for the St. Mary canal, as made at the end of the field season of 1901, contemplated a secondary system of storage in the lower Milk River Valley, and investigations were made here in 1902 with this object in view.

Eight miles east of Malta occurs an alkaline body of water, known as Lake Bowdoin, with an area 6.8 square miles. The lake is situated in a depression, surrounded by a series of hills, and a survey was made in this vicinity with the idea of using the site as a possible reservoir. The plan contemplates diverting Milk River from the south side at a point 20 miles above Malta, and carrying the water to the reservoir.

The feed canal will be 25 miles long, and it is estimated that it will carry 2,000 second-feet of water. It will have a bottom width of 50 feet, depth 12 feet, slopes 1.5 to 1, and a grade of .0001 to about 6 inches to the mile.

Between Malta and the reservoir occurs a divide 50 feet above the lake. At this point a drop to the top surface of the reservoir is made of 25 feet, as only 25 feet of water is to be stored; but from this drop a high-line lateral is to be carried to the south around Beaver Creek, and then continued eastward toward Glasgow.

For a storage depth of 25 feet the capacity of the reservoir will be 298,900 acre-feet and the surface area will be 15,500 acres.

In order to create Lake Bowdoin Reservoir, it will be necessary to build a series of earth embankments across various gaps. There will be eight in all. The total length will be 15,580 feet, and the total quantity 451,783 cubic yards, with these dimensions: Top width 16 feet, slope on water face 3 to 1, and on lower face 2 to 1. Water will be drawn from this reservoir and serve lands to the eastward both north and south of the river.

Engineering surveys are being prosecuted, and will be practically completed on this project this season.

Topographical surveys are also being made on two different scales, one the regular field scale of the survey—that is, 1:45,000 or 1 inch to 3,750 feet, and a larger one, 1 inch to 2,000 feet, that will show all the agricultural lands that can be covered by the project, which is now estimated as 250,000 acres—that is, the total water supply is sufficient for this amount, and the agricultural land will closely approach it.

It is believed that the cost will not exceed $12 an acre, and it may be materially lower. The final estimates will be made this winter, at the close of the present season's work.

After the plans have been passed upon by the Board of Consulting Engineers and found to be feasible, all that will be necessary to start actual construction work will be the final approval of the Secretary of the Interior.

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Engineering surveys are being prosecuted, and will be practically completed on this project this season.

Topographical surveys are also being made on two different scales, one the regular field scale of the survey—that is, 1:45,000 or 1 inch to 3,750 feet, and a larger one, 1 inch to 2,000 feet, that will show all the agricultural lands that can be covered by the project, which is now estimated as 250,000 acres—that is, the total water supply is sufficient for this amount, and the agricultural land will closely approach it.

It is believed that the cost will not exceed $12 an acre, and it may be materially lower. The final estimates will be made this winter, at the close of the present season's work.

After the plans have been passed upon by the Board of Consulting Engineers and found to be feasible, all that will be necessary to start actual construction work will be the final approval of the Secretary of the Interior.

FORESTRY AND IRRIGATION IN CONGRESS

MATTERS RELATING TO THESE SUBJECTS
NOTED IN ORDER OF THEIR OCCURRENCE.

SENATE COMMITTEES.

On Agriculture and Forestry.—Messrs. Proctor, Hansbrough, Warren, Foster of Washington, Dolliver, Quarles, Quay, Bate, Money, Simmons, Latimer.

On Forest Reservations and Game Protection.—Messrs. Burton, Depew, Perkins, Kearns, Kittredge, Burnham, Ankeny, Morgan, Tillman, Gibson, Overman.

On Irrigation.—Messrs. Bard, Warren, Stewart, Kearns, Dietrich, Hansbrough, Ankeny, Fulton, Bailey, Patterson, Gibson, Gorman, Newlands.

On Public Lands.—Messrs. Hansbrough, Nelson, Clark of Wyoming, Bard, Kearns, Gamble, Burton, Dietrich, Fulton, Berry, McEnery, McLaurin, Gibson, Dubois, Newlands.

HOUSE COMMITTEES.

Agriculture.—James W. Wadsworth, E. Stevens Henry, Charles F. Wright, Gilbert N. Haugen, Charles F. Scott, Kittredge Haskins, Joseph V. Graff, George W. Cromer, William Lorimer, Franklin E. Brooks, H. C. Adams, John Lamb, Sydney J. Bowie, Albert S. Burleson, Asbury F. Lever, Phanor Breazeale, John W. Cassingham, and Bernard S. Rodey.

Public Lands.—John F. Lacey, Frank W. Mondell, James M. Miller, James C. Needham, Eben W. Martin, Joseph W. Fordney, Andrew J. Volstead, Joseph M. Dixon, Philip Knopf, George Shiras III, J. J. McCarthy, John F. Shafroth, Francis M. Griffith, John L. Burnett, George P. Foster, William W. Rucker, Carter Glass, and Bernard S. Rodey.

Irrigation of Arid Lands.—Frank W. Mondell, William A. Reeder, Charles Q. Tirrell, John W. Dwight, Thomas F. Marshall, Allen F. Cooper, J. N. Williamson, Oscar W. Underwood, Gilbert M. Hitchcock, C. D. Van Duzer, and Theodore A. Bell.

November 9, 1903.

In the House: Mr. Stephens, of Texas, introduced a bill to open for settlement 505,000 acres of land in the Kiowa, Comanche, and Apache Reservations in Oklahoma. A similar bill was introduced in the Senate November 16 by Mr. Burton.

Mr. Steenerson introduced a bill to authorize the sale of part of the Red Lake Indian Reservation in the State of Minnesota. A similar bill was introduced in the Senate November 19 by Mr. Clapp.

November 10.

In the House: By Mr. Wilson, of Arizona: A bill to authorize construction of a reservoir near San Carlos, Arizona, to provide water for irrigating Sacaton Reservation.

November 11.

In the House: By Mr. Brownlow: A bill for the purchase of a tract in the Southern Appalachian Mountains, to be known as the National Appalachian Forest Reserve. A similar bill was introduced in the Senate November 16 by Mr. Burton.

In the Senate: Mr. Hoar presented resolutions of the legislature of Massachusetts in favor of the enactment of legislation to protect the forests of the White Mountains by including them in a National Park.

By Mr. Warren, of Wyoming: A bill for the relief of persons who made the first payment for desert lands under the act of March 3, 1877, but were unable to perfect entry thereof.

By Mr. Mitchell, of Oregon: A bill to appropriate funds for investigations and tests of American timber.

By Mr. Foster, of Washington: A bill for the improvement of the Mount Rainier National Park.

By Mr. Hansbrough: A bill granting to the State of North Dakota 30,000 acres of land to aid in the maintenance of a school of forestry.

Mr. Warren introduced a joint resolution providing for a careful inquiry and report concerning the present operation of certain public-land laws. Referred to the Committee on Public Lands.

November 12.

In the House, by Mr. Mondell: A bill (H. R. 1987) providing for the

transfer of forest reserves from the Interior Department to the Department of Agriculture.

November 13.

In the House, by Mr. Lacey: A bill to open 550,000 acres of land for settlement in the Kiowa, Comanche, and Apache reservations, in Oklahoma, and also a bill to grant grazing privileges to homestead settlers and holders of small farms in the arid and semi-arid land region.

November 16.

In the Senate: Mr. Hoar presented the petition of James Cowdon, of Washington, D. C., praying for the enactment of legislation to permit the use of public lands for homes without passing of the title.

Mr. Quay introduced bills to enable the people of New Mexico and of Arizona respectively to form a constitution and a state government and be admitted into the Union on an equal footing with the original states.

Mr. McCumber introduced a bill providing for the exclusive use of the proceeds arising from sale of public lands in certain states and territories for the purpose of irrigation and reclamation of arid and semi-arid lands in the state or territory where the lands so sold are situated, until such a time as it shall be definitely ascertained that the whole or any portion of such proceeds can not be feasibly expended in irrigation projects in such state or territory. Mr. Quarles introduced a bill to repeal the act providing for the sale of timber and stone lands, the desert-land act, and the commutation provision of the homestead act.

In the House, by Mr. Hermann: A bill to limit the character of lands selected in lieu of lands covered by unperfected *bona fide* claims or patents within public forest reservations of the United States.

November 17.

In the House, by Mr. Clark: A bill to place wood pulp, printing paper, etc., on the free list.

By Mr. Gillett, of California: A bill providing the means of acquiring title to two groves of *Sequoia gigantea* in the State of California, with a view to making national parks thereof.

November 19.

In the House: A letter from the Secretary of the Interior transmitting, with favorable recommendation, a draft of a bill to control grazing in forest reserves.

By Mr. Martin: A bill to regulate the use of grazing lands surrounding public reservoir sites upon the public lands of the United States.

November 23.

In the Senate: Mr. Quay introduced a bill admitting Oklahoma to the Union.

November 24.

In the Senate: Mr. Bard presented a petition of the San Francisco Chamber of Commerce, praying that an appropriation be made for the purchase of the Calaveras grove of big trees.

Mr. Perkins presented a similar petition.

In the House: Mr. Mondell introduced a bill prohibiting the selection of timber land in lieu of lands in forest reserves.

By Mr. Stephens, of Texas: A resolution asking for report of investigation of land frauds under the stone, desert, timber, and homestead acts.

November 27.

In the Senate: Mr. Mitchell submitted the following resolution, which was considered by unanimous consent and agreed to:

Resolved, That the Secretary of the Interior be, and he is hereby, directed to transmit to the Senate, at his earliest convenience, a statement of the amount in acres of undisposed-of government land of all kinds and characters included in the area of what was originally called "the Oregon country."

In the House: Mr. Gibson introduced a bill for the purchase and establishment of a national reserve in the Appalachian Mountains, to be known as the "National Appalachian Park."

Mr. Porter, Mr. Calderhead, and Mr. Esch each laid upon the Clerk's desk a resolution of the National Association of Agricultural Implement and Vehicle Manufacturers relative to forestry and irrigation.

RECENT PUBLICATIONS.

Any of these books will be sent by the publishers of "Forestry and Irrigation," postpaid, to any address on receipt of the published price, with postage added when the price is marked "net."

Irrigation Engineering. By HERBERT M. WILSON, C. E. 4th edition, revised and enlarged. Pp. 573, pls. 41, figs. 142. John Wiley & Sons, New York.

This is the fourth edition of Mr. Wilson's work on irrigation which has appeared in the last ten years. The book has been rewritten and much enlarged, and much new material upon the subject has been included. No new chapters have been added, but many new articles and the old ones enlarged and increased in value make the book nearly double its former size. The chapters on subsurface waters, pipe irrigation, and pumping in particular have been materially enlarged. Some tables of great assistance in calculating with the complicated and cumbersome formulæ are added.

The rewriting of the volume places it in the forefront of text-books on the subject for American students. Written for Americans, it includes besides descriptions of American irrigation works many examples of the engineer's skill from abroad. The works of India receive much attention, but there is a regrettable lack of information concerning the epoch-making irrigation works along the Nile. America is making long strides toward the improvement of her methods of irrigation; yet some of the most important of these are not mentioned. The chapter on alkali and drainage is poor. The author suggests common lime or neutral calcareous marl as a cheap antidote for many alkaline salts. What beneficial effect lime or marl would have on our western alkaline soils is not stated, and drainage—drainage, the twin brother of irrigation—is dismissed with three short paragraphs aggregating less than a page. The work is well illustrated, written in a clear and attractive style, and the author deserves thanks for his painstaking effort.

Bulletin of the Department of Agriculture. Vol. I, No. 11. Kingston, Jamaica. November, 1903. Government Printing Office.

This bulletin contains a number of discussions upon agricultural and horticultural subjects which are confined almost entirely in interest to dwellers in the tropics.

Report of the Secretary of Agriculture. 1903. 106 pp. Government Printing Office, Washington, D. C.

Secretary Wilson's report comprises a brief review of the most valuable work accomplished during the year by each of the bureaus and divisions under his control.

Even a hasty perusal of this report can hardly fail to impress upon one that the Department of Agriculture is doing a magnificent work for the present profit and the future upbuilding of the nation.

Forestry Quarterly. Vol. II, No. 1. Ithaca, N. Y., 1903.

This journal, formerly published under the auspices of the Cornell Forest School, has now entered upon an independent career. Dr. Fernow is the chief of a board of editors, eleven in all, drawn from the profession at large and representing the various centers of American forest work. Among them we note the familiar names of Prof. Henry S. Graves, Prof. Filibert Roth, Dr. John Gifford, R. T. Fisher, and E. A. Sterling. The forest schools and the Bureau of Forestry are thus well represented. Walter Mulford, State Forester of Connecticut; A. S. Williams and Frederick Dunlap, of Ithaca; S. J. Flintham, of New Haven, and Clyde Leavitt, of Ann Arbor, are the remaining members of the board.

The current number contains a most interesting article on the forest fires in the Adirondacks during the past spring by A. Knechtel, the Forester of the New York State Forest, Fish, and Game Commission.

R. G. Zon, of the Bureau of Forestry, contributes a valuable discussion of the effect of frost upon forest vegetation, and Austin Cary, Forester to the Berlin Mills, writes of relative frost hardiness of species along the Androscoggin River.

In "News and Notes" is found matter of interest in an editorial comment upon the recent collapse of the New York State College of Forestry.

Nebraska Educational Directory. 1903-1904. Republican Print. St. Paul, Neb., November, 1903.

This little pamphlet, issued by the State Department of Public Instruction at Lincoln, is a collection of statistics covering many points of information regarding the schools of Nebraska, in all grades, both public and private.

NEW MEMBERS OF AMERICAN FORESTRY ASSOCIATION.

The following-named persons have joined the American Forestry Association since November 1:

American Lumber and Mfg. Co., Publication bldg., Pittsburg, Pa.

Ames, Chas. W., 501 Grand ave., St. Paul, Minn.

Bailey, Vernon, Dep't of Agriculture, Washington, D. C.

Barnard, George A., Millbrook st., Boston, Mass.

Billings, Miss Elizabeth, Woodstock, Vt. Life membership.

Blades Lumber Co., New Berne, N. C.

Blake, Miss Isabel, 29 Greenough ave., Jamaica Plain, Mass.
Bliss, Harriet C., 154 W. Main st., New Britain, Conn.
Bridgeman, H. H., Norfolk, Conn.
Bullock, A. G., Worcester, Mass.
Burr, Allston, 60 State st., Boston, Mass.
Carren, William, Burlington, Iowa.
Chamberlain, Emerson, 2 Wall st., New York city.
Churchill, Joseph R., Sears bldg., Boston, Mass.
Davis, C. H., Saginaw, W. S., Mich.
Dick, Mrs. William Alexander, Chestnut Hill, Philadelphia, Pa.
Eddy, Walter S., Eddy bldg., Saginaw, Mich.
Elton, John P., Waterbury, Conn.
Fellows, Dr. Dana W., Portland, Me.
Forbes, Mrs. W. H., Milton, Mass.
Fowler, Rufus B., 3 Tuckerman st., Worcester, Mass.
Gibson, Chas. A., Bangor, Maine.
Goodenough, Martha, 806 N. 11th st., Reading, Pa.
Gould, Chas. H., 290 Harvard st., Cambridge, Mass.
Grant, Schuyler, 80 Griswold st., Detroit, Mich.
Hatt, W. K., Lafayette, Ind.
Hawley, Ralph C., Yale Forest School, New Haven, Conn.
Heaton, John W., 245 York st., New Haven, Conn.
Higbie, Robert W., 45 Broadway, New York city.
Hubbard, Jas. M., 382 Marlboro st., Boston, Mass.
Kennedy, Robert W., Trenton, N. J.
Kinney, David G., 25 Whalley ave., New Haven, Conn.
Langdameo, Jenaro E., 94 Division st., New Haven, Conn.
Lewis, A. N., 323 West Main st., New Britain, Conn.
Lowell, John, Chestnut Hill, Mass.
McCormick, W. M., 218 Girard bldg., Philadelphia, Pa.
McCrillis, Alonzo, Whiteface, N. Sandwich, N. H.
Mackenzie, F. S., Woodstock, Vt.
Mallinckrodt, Edward, Mallinckrodt Chemical Works, St. Louis, Mo.
Marshall, G. E., Cass Lake, Minn.
Miller, Mrs. Georgene L., 360 Prospect st., New Haven, Conn.
Palmer, W. J., Director of Agriculture, Bloemfontein, Orange River Colony, South Africa.
Parker, F. E., Saginaw, Mich.
Rippey, W. D., Severance, Kansas.
Robinson, Hiram, 150 McLaren st., Ottawa, Ont., Canada.
Rochester, De Lancey (M. D.), 469 Franklin st., Buffalo, N. Y.
Sanford & Treadway, box 315, New Haven, Conn.
Schroeder, Fred J., Milwaukee, Wis.
Seattle Cedar Lumber Mfg. Co., Seattle, Wash.
Smedley, Dr. William, 604 California bldg., Denver, Colo.
Smith, Edward B., Penllyn, Pa.
Smith, Frederick B., 109 Seward ave., Detroit, Mich.
Souder & Co., Edmund H., 502 Girard bldg., Philadelphia, Pa.
Tracy, F. G., Carlsbad, N. Mex.
Van Santvoort, Miss, 38 West 39th st., New York city.
Van Valzah, Dr. Wm. W., 10 East 43d st., New York city.
Von Wernstedt, Sage, 142 Sheffield ave., New Haven, Conn.
Wainwright, Richard T., Rye, N. Y.
Walbridge, Robert Ryckman, 37 Prospect Park, West, Brooklyn, N. Y.
Washburn, W. D., 300 Guaranty bldg., Minneapolis, Minn.
Wheeler, N. P., Endeavor, Pa.
Williamson, J. N., Washington, D. C.
Willis, Miss Lena, Naples, Maine.
Wood-Barker Company, 911 Exchange bldg., Boston, Mass.
Woodward, George R., Penfield, Pa.

PUBLICATIONS RECEIVED.

The Fern Bulletin: A Quarterly Devoted to Ferns. Vol. XII, No. 4. Binghamton, N.Y., October, 1903.

Seventeen Year Locusts in Kentucky. Bulletin No. 107, Agricultural Experiment Station, State College of Kentucky. Lexington, May, 1903.

Monthly Bulletin of the International Bureau of American Republics. Washington, D. C.: Government Printing Office, 1903.

The Hawaiian Planters' Monthly. Vol. XXII, No. 11. The Hawaiian Gazette Co., Honolulu, November, 1903.

The Agricultural Gazette of New South Wales. Vol. XIV, part 10. Sydney, October, 1903.

U. S. Department of Agriculture, Bureau of Chemistry, Bulletin No. 79. The Testing of Road Materials. By Logan Waller Page, Chief, Road Material Laboratory. Washington: Government Printing Office, 1903.

Minnesota State Forestry Board, Bulletin No. 2. Volume Tables for White Spruce and Other Trees. By T. L. Duncan.

Birds and Nature. Vol. XIV, No. 6, December, 1903. A. W. Mumford, publisher, 378 Wabash avenue, Chicago, Ill.

FOREST FABLES.

FORESTRY, LIKE FISHING, FURNISHES BIG STORIES.

We give some stories which are going the rounds of the press, vouched for by publications which are supposed to be authoritative.

Newspapers are known to be unreliable, though the general reader is not aware of the fulness of that unreliability. In one subject a reader may be able to find grave errors because he is more or less familiar with facts which concern a particular branch of human endeavor upon which the publication has occasion to comment. We have been able to gather a few items in our own particular line.

One of the best of these comes from the *Saturday Evening Post* and concerns

"THE MOST USEFUL TREE."

Of all forest trees the Eucalyptus is the most beneficial to mankind. The list of useful articles it furnishes to the world is almost incredible.

It is predicted by the United States Bureau of Forestry that within a few years the different varieties of Eucalypts will solve the fuel problem, both in America and Europe. In the rapidity and hardiness of its growth this tree has no equal. Five years from the time of planting, groves raised from seedlings will yield 75 cords of stove wood an acre. Three to five years from the time of cutting, sprouts that spring from the stumps mature into trees that produce more cords to the acre than the original growth. Repeated cuttings add to the thriftiness of the Eucalyptus. A period of 25 years will develop trees the size of oaks known to be 300 years old. In some sections of the Southwest where oak has been nearly exhausted as fuel, the Eucalyptus is taking its place.

Some varieties thrive in tropical swamps; others flourish in the mountain snows, *far above the timber line*. To every degree of climate and condition between these extremes some species of this prolific genus is adapted. Scientists have demonstrated that Eucalypts have a wonderful effect on climate. From some of the swampy areas of Italy malaria has been banished by the growth of Eucalyptus groves. This is due both to the tonic and medicinal effect of its aroma and to the tree's phenomenal capacity for absorbing water.

Notwithstanding the latter trait, however, some varieties of the Blue Gum will thrive on arid plains. Soil on which not even cactus will live will produce great Eucalyptus trees.

The genus is invaluable as a source of timber. The uses it is put to in this regard are amazingly diverse. In Australia it is used extensively in the construction of ships, buildings, bridges, vehicles, agricultural implements, furniture, barrels, and hundreds of minor articles.

Faultless hardwood logs over 200 feet long, 12 feet in diameter at the top, and 30 feet in diameter at the base are hewn from giant Eucalypts.

It is one of the most durable of hardwoods. This is a remarkable fact when the celerity of its growth is considered. In repairing a decayed pier at Santa Barbara, California, it was found that a few piles were perfectly sound. Examination disclosed that they had been hewn from Eucalyptus trees.

This was printed a little less than a year ago, and we have repeated it *verbatim et literatim* in order that there be no mistake about this tree, which possesses wonders beyond the wildest dreams of Jack and his Beanstalk; and this was the result of a bulletin prepared by the Bureau of Forestry, a bulletin which most of our readers have seen, and which in this instance achieved a notoriety that was not aimed at or expected. Just think of the points brought out! According to the voracious, not to say veracious, space writer who seized upon this harmless bulletin for his meat, we have in the Eucalyptus the first and only tree to grow above the timber line, and we begin to wonder what the timber line was ever invented for. Consider the fact of saw-logs grown while you wait, and the prolific sprouting which utterly puts to shame the succulent asparagus. But the anxious public was not content to accept this great boon in silence. The value of the *Saturday Evening Post* as an advertising medium is evidently ahead of its editorial worth, for the mail clerks of the Bureau were sadly overworked for many weeks opening letters from persons who wanted information, seeds, cuttings, and all manner of things connected with the Eucalyptus. The mail force was nearly swamped, and it was thought that an extra appropriation for clerical help would be the only thing to save the situation. Now, however, things have come to the normal order, and the applications for more information concerning this tree of wonders are sporadic and cause only a slight trouble.

Another freak forest story is that concerning the cork forests of Spain, so valuable that the fabled wealth of Golconda pales into insignificance. This story is now more than two years old, and has been fostered by the most reputable journals, until at this time it has not only the respect due to age, but that due to a perennially accepted truth, secure in an honored niche. It was calculated to stir the emotions to their depths, and ended with the statement that the cork forests of Spain extended over an area of 620,000 square miles. This alone should stamp the lie, as it were, because the most reputable geographies credit Spain with no more than a total area of 194,800 square miles, which gives us the remarkable spectacle of forests so valuable to a country that they are permitted to cover the entire area to the exclusion of all else, and lap over into the Atlantic Ocean, Mediterranean Sea, and adjacent countries on all sides. But not to jest with this great truth, grown hoary with long service, we advance the theory that there are three layers of forest, one above the other.

REAL ESTATE

FORESTRY AND IRRIGATION conducts a real estate department, the services of which are offered to all readers of this magazine. It will endeavor, through judicious advertising and correspondence, to buy and sell property of every kind. In other words, this department will act as an agent in any transactions our readers may have involving real estate. For this service there will be no charge unless a sale is concluded, when the usual commission will be expected.

To all interested we would say that it costs no more than the postage from your end to make known your wants—either to acquire or dispose of property.

We desire to impress our patrons with the fact that this magazine guarantees honest treatment. The Real Estate department is managed by competent and experienced men who will devote their best efforts toward building up a national business and a national reputation for fair dealing. We call particular attention to the fact that no property will be listed on our books that will not bear out under the closest investigation everything that is claimed in its behalf. While we wish to handle small properties and will give them careful attention, we propose to make a speciality of large properties and enterprises, as we have exceptional opportunites for reaching capital seeking paying investments, especially in the West and South. The character of investments which seem to be most in demand are manufacturing sites, farming, grazing, and timber lands. We also have inquiries relative to orange groves both in Florida and California.

WANTED

In Colorado or Wyoming, a ranch property of about 2,000 acres, having some irrigated land suitable for alfalfa or other cultivated grasses, ample water, necessary buildings, fenced or partly so. One already stocked with cattle preferred.

WANTED

From one to twenty thousand acres of standing white oak timber, convenient to lines of transportation, for immediate purchaser.

PROPERTIES FOR SALE

DISTRICT OF COLUMBIA

We make a specialty of Washington City real estate and investments, and are prepared to furnish any information desired to those looking to an investment, or toward a temporary or permanent residence.

ARKANSAS

MANGANESE ORE LANDS.—800 acres, half mile from R. R., analyzing 50 % metallic ore. Estimated to yield 800,000 tons at cost not to exceed $2 per ton, f. o. b. Fine investment. Particulars on application.

CALIFORNIA

CALIFORNIA TIMBER

GROUP A.—5,000 acres sugar and yellow pine in Eldorado county; will cut 45,000 feet per acre. **$20 per acre.**

GROUP B.—2,000 acres yellow pine in Eldorado county; will cut 25,000 feet per acre, and 4,000 cords of wood on tract in addition; when cleared, the best deciduous fruit lands in the state. **Only $6 per acre.**

GROUP C.—4,640 acres of redwood in Mendocino county, on line of railroad; will cut 40,000 feet per acre; also Oregon pine, not estimated. **$20 per acre.**

GROUP D.—22,000 acres of redwood timber in Mendocino county; more than 400,000,000 feet now standing; railway to shipping point on ocean; this proposition includes mills in operation; capacity, 100,000 feet per day; net profits alleged to be $75,000 to $100,000 per annum. **Bargain at $450,000.**

GROUP E.—12,000 acres redwood on Garcia River, Mendocino county; mill site and landing on ocean; will cut 40,000 feet per acre. **Price, $25 per acre.**

Cedar, pine, and spruce lands also for sale in unlimited quantities, particulars of which furnished on application.

CALIFORNIA—Continued

STOCK AND FRUIT RANCH AND PLACER MINE.—420 acres near Sacramento, Cal., under fence; 10-room house and all necessary outbuildings; 80 acres under cultivation; 200 acres excellent alfalfa land; 100 acres good placer gravel, carrying values from 40 to 75 cents per cubic yard; 6 acres of vineyard; orange and olives trees also grown. This property adapted for the growing of both deciduous and citrus fruits, all under irrigation ditch. **To quick purchaser, $7,500.**

ORANGE RANCH IN FULL BEARING.—46 acres farm, with citrus and deciduous fruits, in the best fruit belt of California. Home and outbuildings, with abundant water for irrigation and domestic use. Ready market for all crops. Will pay more than 15 per cent. on purchase price, which is **only $3,000.**

FLORIDA

NEAR AVON PARK.—Grape fruit and orange grove for sale, very reasonable.

CYPRESS TIMBER.—Near the St. John's River, about 1,400 acres of probably the finest cypress timber in the universe; estimated to cut from 80 to 100,000,000 feet; can be bought cheap for the quality; located in the midst of a forest of Long Leaf Yellow Pine that will cut 3,500 feet to the acre, also at a reasonable price. Full particulars given on application. This property never before advertised

HANDSOME HOTEL FOR SALE.—In Southern Florida, thoroughly equipped with all modern conveniences, ice plant, etc. No mosquitoes or malaria. Filled to overflowing with guests each winter. Owned by a northern capitalist who cannot give his attention to the business. **Cost $25,000, for sale at $15,000.** An experienced hotel man can make a fortune out of the business. Ask for prospectus.

64,000 acres; average cut, 2,000 feet of pine to the acre. These lands lie in the noted lemon, orange, and vegetable belt of the state, and have transportation facilities by both rail and water.

90,000 acres; this tract contains 70,000 acres of Longleaf Pine and 20,000 acres of Cypress. The timber is estimated to cut from 2,000 to 3,000 feet per acre. A large sawmill costing $40,000 is located on this land and is included in the sale of the land and timber. This mill is located on a river to which a great deal of this tract is contiguous.

IOWA

VALUABLE FRUIT FARM.—Orchard of 7 acres in full bearing, assorted fruits, with 10-room house and buildings. Rockford, Iowa. Private and city water. Fine local market. **Only $4,500.**

LOUISIANA

RED RIVER PLANTATION.—1,605 acres; on railroad; has 2 miles river front; richest soil in state; 800 acres in cultivation, 800 in timber—cypress and oak; timber alone a paying investment; 1 to 1½ bales cotton per acre; 60 bu. corn, 8 tons alfalfa. Improvements—new steam gin plant and press, cost $5,000; store building, large residence, 32 tenant houses, barn, and outbuildings. **Only 48,000,** $10,000 down and balance in easy payments.

FIRST CLASS FARM.—750 acres near Shrevesport, La., De Soto Parish; grows cotton, corn, tobacco, and fruit; would make ideal stock farm. **Cheap at $3,550.**

GOOD INVESTMENTS.—Several tracts on main line of railroads to Cincinnati and St. Louis, $2.50 to $5 per acre. Good fruit country, and when planted in fruit trees sells readily for $25 per acre. Write for particulars.

15 PER CENT INVESTMENT.—Plantation contiguous to Mississippi River, one mile from steamboat landing. 1,320 acres alluvial land, with improvements consisting of good dwelling, cotton gin, new engine, and boiler. One large store is rented for $30 per month. Agricultural implements go with place, and stock will be sold at reduced price to purchaser. 1,120 acres in cultivation, producing excellent cotton. **Only $45,000;** one-half cash, balance in 1 and 2 years.

HARDWOOD TIMBER LAND.—175,000 acres alluvial land will be sold in parcels to suit purchaser at from $5 to $12 per acre. Can sell 100,000 acres in solid body. All soil is rich, and difference in price depends wholly on value of timber standing, which will cut from 3,000 to 6,000 feet per acre. To home-seekers, small tracts at $10 per acre, $1.50 down and balance in 3 and 5 years. Rice, sugar cane, cotton, and alfalfa are not grown to better advantage anywhere else in the state.

MARYLAND AND VIRGINIA

The location of these two states, their fertility, and market and transportation facilities, as well as their temperate and healthful climate, make them an ideal part of the United States for residence or as profitable fields for investment. Persons living in the northern states are taking advantage of these conditions. We have a number of farms, from 40 to 1,000 acres in extent, for sale in both of these states; also residences in the pretty suburban towns just outside of Washington.

FOR SALE.—An excellent farm in Fauquier county, Virginia, 3 miles from Warrenton, and only ½ mile from railroad at Meetze Station, with post-office, store, freight depot, etc. Property consists of 147 acres rolling land, with good barn; fences, and outbuildings; 75 acres under cultivation; 15-acre woodlot, with good timber. Running stream through farm, and several springs. Climate good. Would make an ideal summer resort, and is in the best fox-hunting section of the state. **Price only $2,500**

OLD VIRGINIA ESTATE—Rare bargain near Warrenton, 30 miles from Washington; 418 acres good agricultural or stock land, well fenced and watered. Blue grass belt, neighborhood of wealthy and exclusive Virginia families. Improvements—15 room mansion, 2 large barns, 2 tenant houses, outbuildings. Bargain at **$12,000.**

IN THE FAMOUS SHENANDOAH VALLEY.—120 acres, fine orchard, running stream through farm; 3 miles from Berryville, ½ mile from railroad station. Modern house and necessary outbuildings. Good water-power mill-site. Complete as it stands, 24 head of cattle, horses, pigs, chickens, etc., $12,800. As land alone sells for $100 per acre in this neighborhood, improvements and stock are practically free.

FARM OF 171 ACRES.—With three-fourths of a mile water front on the Chesapeake Bay, adjacent to Baltimore. New dwelling and outbuildings. Cannot be surpassed for the man who wants a summer home, with crabbing or fishing unequaled, or as a permanent home. No sandy soil; tomatoes raised last year averaged $100 an acre. Brick house of 9 rooms, meat house, poultry house, corncrib, stable for six horses, implement shed, granary, hog house, all new, and substantially built with good materials. Fish, oysters, hard and soft-shell crabs in abundance. A bargain not often found. Price, **$10,000.**

OPPORTUNITY FOR FEMALE COLLEGE, OR SANITARIUM.—At Gaithersburg, Md. Metropolitan Branch B. & O. R. R., twenty miles from the Capital, 600 feet elevation, handsome large building in magnificent oak grove. Splendidly adapted and built for educational purposes. Located in wealthy community which will guarantee support. To the right man the opportunity of his life. Can be bought for half its value.

MICHIGAN

FARM OF 547 ACRES.—Situated near Grand Rapids, Mich. Macadamized road; rural free delivery. All cleared but about 40 acres. Numerous buildings and ample water. Land partly fenced. Considerable fruit and grapes. **Price, $75.00 an acre.**

MINNESOTA

SAWMILL PROPERTY.—Saw, lath, and shingle mill, 70 h. p., in virgin forest of pine, spruce, balsam, tamarack, cedar, and poplar; on railroad. Dwelling house and outbuildings, with 160 acres uncut timber. Opportunity for good manager, at **$6,000.** 1,500 acres adjoining timber land also for sale.

FINE HOTEL PROPERTY.—32-room hotel and outbuildings, in perfect repair; gas and electric lights; a. m. i.; 30 regular boarders besides transients. At Winona, Minn. Owner's death necessitates sale. **$13,000.**

MISSISSIPPI

WATER POWER AT A GREAT BARGAIN.—$3,900 buys a splendid water power in southern cotton belt, developing 600 h. p. or over; perpendicular fall of 70 feet. 320 acres go with property. Only 12 miles from Meridian, Miss., a growing town of 20,000 population, to which electric power can be transmitted with only 10 per cent loss. Property cheap at $10,000.

LONG LEAF YELLOW PINE.—18,000 acres, estimated to contain 100,000,000 feet, on railroad near Mobile, Ala. Planing and sawmill plant, with daily capacity of 25,000 feet; also dry-kiln. Big profits to man with capital and experience. Particulars and price on application. Also 10,000 acres timber land, same locality and character.

WILL PAY FOR ITSELF.—560 acres, near Ackerman, Miss., on railroad, with fencing and other improvements; 175 acres in cultivation, 285 in timber, market for which is already assured. Enterprising man could make land pay for itself in first year. **Price $5,600.**

MISSISSIPPI—Continued

COLONIAL HOME.—"The Oaks," magnificent estate near Jackson, Miss. 913 acres good soil in high state of cultivation; improved by finest country residence in central Mississippi; cost $16,000 to build. Barns, stock sheds, and outbuildings. Only **$20,000** to immediate purchaser.

VIRGIN FOREST.—11,000 acres hardwood timber on railroad in Yazoo county; a paying investment at **$11 per acre.**

TIMBER LANDS.—1,080 acres valuable timber land on Southern R. R. and watercourse, at Sapa; **$4 per acre.** Also 480 acres virgin hardwood, white oak, hickory, and gum, near Jackson; **$12.50 per acre.**

NEW YORK

FOR SALE.—About 690 acres of unimproved land in the central part of Long Island (Suffolk county, N. Y.), within 60 miles of New York City, and 2½ miles from railway station, on the Long Island Railway.

Part of an old estate, and has never been under cultivation. Adjoining tracts have made excellent farming land. Soil is sandy, drainage good; no swampy land; well wooded, chiefly with pine. As the property stands it would make a good game preserve, or could be made productive by suitable foresting.

Price, **$10** per acre. An excellent investment for one who would develop the property, as it would double in value in a few years.

HANDSOME ESTATE.—Estate known as the "Uplands," near Glen Cove, L. I.; 100 feet above water; fine view of Hempstead harbor; 45 acres handsomely improved property, in lawns, drives, gardens, and orchard; complete water system. Magnificent 3 story dwelling, luxuriously finished, 24 rooms, hot and cold water throughout; stable and carriage house, greenhouse, gardener's and coachman's cottages, etc. **$100,000.** Other property in same locality for sale.

A PAYING HOTEL—A well-known hotel property in the Adirondacks; includes good sized hotel and furnishings, horses, carriages, boats; 1,200 acres of mountain land, with two small lakes well stocked with trout. A great bargain at **$25,000.**

NORTH CAROLINA

250,000 ACRES FARMING AND TIMBER LANDS.—First and second growth estimated to cut 350,000,000 feet of pine, 500,000,000 feet of gum, 75,000,000 feet cypress. Juniper estimated to cut 2,000,000 poles. Located on the Atlantic coast. Railroad and two rivers. **Price, $2.00 an acre.**

SOUTH CAROLINA

500,000,000 FEET OF CHOICE STANDING TIMBER.—In South Carolina, convenient to transportation both by rail and water, near tide water possessing fine harbor.

GROUP A.—Consists of 11,000 acres, estimated to cut 25,000,000 feet of cypress, as choice as grows in the South; 18,000,000 feet excellent short-leaf pine, 5,000,000 feet of cottonwood, 8,000,000 feet of oak, 3,000,000 feet of ash, balance of timber hickory, sycamore, elm, gum, etc. **$1.00 per thousand.**

GROUP B.—22,000 acres, estimated to cut 80,000,000 feet of choice cypress, 70,000,000 choice short-leaf North Carolina pine, balance of timber oak, ash, hickory, sycamore, gum, etc. **$1.50 per thousand.**

GROUP C.—14,000 acres, estimated to cut 30,000,000 feet of choice cypress, 15,000,000 of oak, 15,000,000 short-leaf pine, 8,000,000 cottonwood, 10,000,000 ash, balance hickory, sycamore, elm, gum, etc. **$1.00 per thousand.**

TENNESSEE

SLATE QUARRY.—Fine quarry, easily and inexpensively mined, with water transportation and on line of proposed railroad. Worked profitably for 18 months, with orders for 2 years in advance. Slate outcrops from 50 to 150 feet above ground, first quality and inexhaustible. 2,300 acres in this property, which will cut 5,000 feet of hardwood per acre. Will sell outright at fraction of value, or arrange for capital to finance and properly exploit mines. Unrivalled opportunity for investment. Address this department for further particulars.

COAL LAND.—3,000 acres Jellico coal land on main line of C. N. O. & T. R. R. in Kentucky, near Tennessee line. Mines are now paying net profit of $1 per ton to owner, and will pay more. Further particulars on application.

WEST VIRGINIA

LIME AND CEMENT.—472 acres, containing coal, lime, and cement stone. Limestone 400 feet thick, cement rock 35 feet thick, and coal 4 to 5 feet thick. Plenty of timber on property. Plant ready for operation with modern machinery; railroad sidings on premises. For further details apply to this department.

WEST VIRGINIA—Continued

SPECIAL, 20,000 ACRES OF TIMBER.—Spruce and hemlock; one-half will cut 20,000 feet to the acre, balance 12,000 feet. Modern sawmill, daily capacity 50,000 feet; planer, docks, trams, etc.; 10 miles standard gauge railroad, with engine, cars, steam loader, and skidder; 8 miles additional graded, with ties and rails on ground ready to lay. Storehouse, dwellings; in short, a modern lumber plant in daily operation on railroad, with good connections east and west. Apply for further particulars.

COAL LANDS.—10,000 acres coal lands, convenient to railroads; three veins, one 4½ feet thick, and without slate. Cheap. Send for particulars.

TIMBER INVESTMENTS.—8,000 acres spruce and hemlock, on railroad; will cut 20,000 feet per acre. **$35 per acre.**

1,500 acres spruce and hemlock, 2 miles from railroad; will cut 25,000 feet per acre. **$37 per acre.**

54,000,000 feet fine timber, on tract of 5,500 acres on Greenbriar River and C. & O. R.R.; will cut 20,000,000 hemlock, 10,000,000 white oak, 7,000,000 red oak, 8,000,000 chestnut oak, 1,000,000 white pine, and 8,000,000 poplar, birch, chestnut, linden, hickory, locust, etc. Profits on tan bark alone will pay for the land. **$18 per acre.**

We have many other valuable mineral and timber properties in this state on our books. Particulars on application.

COAL, IRON, OIL, AND TIMBER LANDS.—7,000 acres on main line Norfolk and Western. Coal developed already; timber worth $88,000; complete prospectus furnished.

WYOMING

FOR SALE.—Wyoming cattle ranch, near Saratoga, in the valley of the North Platte, 1,880 acres deeded land, irrigated and producing crops; 3,000 acres state leased lands adjoining; 25 miles fencing. Finest summer range in the foothills of the mountains, where stock prosper and grow. Plenty of shade, grass, and pure running streams of water. Fine ranch buildings. Modern 9-room log house, corrals, stable, shop, with water-power for grinding sickles. Priority water rights. Good neighbors, school, and church. Will sell low, or will rent to capable party for term of years. Profitably operated for 17 years. Stocked with Hereford cattle. **Price, $80,000.**

WINTER HOME FOR RENT

At Phœnix, Arizona, which has the most equable winter climate in the United States.

A comfortable house of seven large rooms, one mile from Phœnix; completely furnished, and possession can be given at once. House and grounds in excellent condition.

For further particulars

Address LEE M. LIPSCOMB

Manager Real Estate Department, Forestry and Irrigation

Washington, D. C.

ORGANIZED APRIL, 1882. INCORPORATED JANUARY, 1897.

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WASHINGTON, D. C.

DEAR SIR: I hereby signify my desire to become a member of the American Forestry Association. Two dollars ($2.00) for annual dues enclosed herewith.

Very truly yours,

Name.....

P. O. Address.....

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